ACS800

Firmware Manual
IGBT Supply Control Program 7.x

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Firmware Manual

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Introduction to the manual

What this chapter contains

This chapter includes a description of the contents of the manual. In addition it contains information about the compatibility, safety, intended audience, and related publications.

Compatibility

This manual is compatible with version IXXR7220 IGBT supply control program. The program is used in line-side converters of ACS800 multidrive, ACS800-17 and ACS800-11/U11.

Safety instructions

Follow all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission, or use the drive. For single drive the complete safety instructions are given at the beginning of the hardware manual. For multidrive safety instructions, see *ACS800 Multidrive Safety Instructions* [3AFE64760432 (English)].
- Read the **software function specific warnings and notes** before changing the default settings of the function. For each function, the warnings and notes are given in this manual in the subsection describing the related user-adjustable parameters.

Reader

The reader of the manual is expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

Terms

Term	Description
Line-side converter / converter	In this manual the ACS800 IGBT supply unit is referred to as line-side converter / converter.
DriveWindow	PC tool for operating, controlling and monitoring ABB drives
APBU/NPBU	Branching unit for parallel connected converters
INT	Main Circuit Interface Board
RDCO	DDCS Communication Option module
RDCU	Drive Control Unit
RMIO	Motor Control and I/O Board

Contents

The manual consists of the following chapters:

- *Start-up* describes the basic start-up procedure of the line-side converter.
- *Program features* contains the feature descriptions and the reference lists of the user settings and diagnostic signals.
- *Actual signals and parameters* describes the actual signals and parameters of the line-side converter.
- *Fieldbus control* describes the communication through serial communication links.
- *Fault tracing* lists the warning and fault messages with the possible causes and remedies.

Start-up

What this chapter contains

This chapter describes the basic start-up procedure of the line-side converter.

How to start-up the converter

SAFETY		
	The start-up can only be carried out by a qualified electrician. The safety instructions must be followed during the start-up procedure. See the safety instructions on the first pages of the appropriate hardware manual or for multidrive, see *ACS800 Multidrive Safety Instructions* [3AFE64760432 (English)].	
☐	Check the installation.	
POWER-UP		
☐	Open the earthing switch. **Note:** The earthing switch and the main disconnecting device are either mechanically coupled or electrically interlocked: Earthing switch can be closed only when the main disconnecting device is open. The disconnector can be closed only when the earthing switch is open.	Optional device. See delivery specific circuit diagrams.
☐	Close the main breaker of the supply transformer.	
☐	Close the auxiliary circuit switch-fuse.	Optional device. See delivery specific circuit diagrams.
☐	Close the main breaker of the drive and start the line-side converter: - Reset the starting logic with the RESET button on the cabinet door. - Turn the starting switch on the cabinet door from position 0 to START position for 2 seconds, release and leave it to position 1.	

Note: Line-side converter parameters do not need to be set in a normal start-up procedure or in normal use!

Program features

What this chapter contains

This chapter describes control program features.

Note: The parameters listed in this chapter do not need to be set in normal use! They are only mentioned for explaining the program features.

Symbols used

Symbol	Description
(1.10) , 11.11	Actual signal or parameter (See chapter *Actual signals and parameters*.)
113.05	Parameter above 100. These parameters are not visible to the user unless the password is entered for the parameter lock in parameter 16.03 PASS CODE. These parameters are not allowed to be changed without ABB's permission.

Local control vs. external control

The converter can be controlled/monitored:

- locally from control panel (connect the panel cable to the panel interface on the RDCU Drive Control Unit)
- locally from DriveWindow PC tool (connect the fibre optic cables to DDCS channel CH3 on the RDCO DDCS Communication Option module)
- externally via I/O connections or fieldbus interface.

With control panel or DriveWindow PC tool the user can change parameters and view or reset the fault history. When the start key is pressed in local control mode, the intermediate circuit charges and the converter starts to modulate. For instructions on how to use the control panel, see the Firmware Manual of the motor-side converter application program.

For the default I/O connections, see section *RMIO board connection diagrams* on page *28*.

For information on how to control/monitor the converter through an external control system, see chapter *Fieldbus control*.

DriveWindow connection

DriveWindow and other tools can be connected to DDCS channel CH3, either in a ring, or a star configuration using NDBU-xx branching units. Before starting the communication, node numbers must be set for each converter. See parameter 70.15 CH3 NODE ADDR. This setting can be made by a point to point connection with control panel CDP 312R or DriveWindow. The new node address becomes valid on the next power-up of the RMIO board. DDCS channel CH3 is the slave in the communication link.

Identification routine

At first start the line-side converter adapts itself to the supply network automatically. No network data needs to be set by the user.

During the Line-side Identification, the supply network voltage level is estimated based on DC voltage measurement. If the value is within allowed limits, the procedure checks the frequency of the network (50 Hz or 60 Hz) and the phase order. Identification takes approximately five seconds during which the line-side converter may not be loaded.

The automatic Line-side Identification routine is active as default and it is repeated each time the line-side converter receives a start command after the control board (RMIO) is powered. The automatic Line-side Identification routine can be inactivated by a parameter if the identification routine has been performed during the first start-up and the phase order has not been changed after the first start-up. A manual identification can also be chosen instead.

Settings and diagnostics

Parameters	Description
99.07	Activation of the manual Line-side Identification
99.08	Activation of the automatic Line-side Identification
Actual signals	
02.07	Nominal DC voltage reference
Faults	
NET VOLT FLT	Main supply voltage is out of acceptable range.

Charging

After receiving the start command the line-side converter closes the charging contactor which in turn connects the intermediate DC link capacitors to the AC supply via the charging resistors. The DC link voltage rises and when it is high enough, the main contactor/breaker is closed and the charging contactor is opened. The contactors are controlled by the line-side converter control board (RMIO) via relay outputs RO1 and RO3.

Settings and diagnostics

Faults	Description
CHARGING FLT	Charging has failed.
MAIN CNT FLT	Main contactor fault. Main contactor/breaker is not closed or digital input DI3 signal is missing.

Synchronisation

First, the line-side converter is synchronised to the network by a three-phase short circuit. On the basis of the short circuit current, the unit can identify the phase order of the supply network and the starting point for the flux/voltage vector.

There are two alternative means for the synchronisation, one with phase order check and the other without. The method can be chosen by a parameter.

No phase order check is performed as default since it is done during the Line-side Identification. If the phase order is changed after the first start, the Line-side Identification routine needs to be repeated.

If the synchronisation with phase order check is selected, the phase order can be changed without performing the Line-side Identification routine again.

If the first synchronisation trial fails, the unit makes up to 9 additional trials.

Settings and diagnostics

Parameters	Description
99.06	Selection of the synchronisation
Faults	
SUPPLY PHASE	Phase missing
SYNCHRO FLT	Short-circuit current is below limit. 9 synchronisation trials have failed.

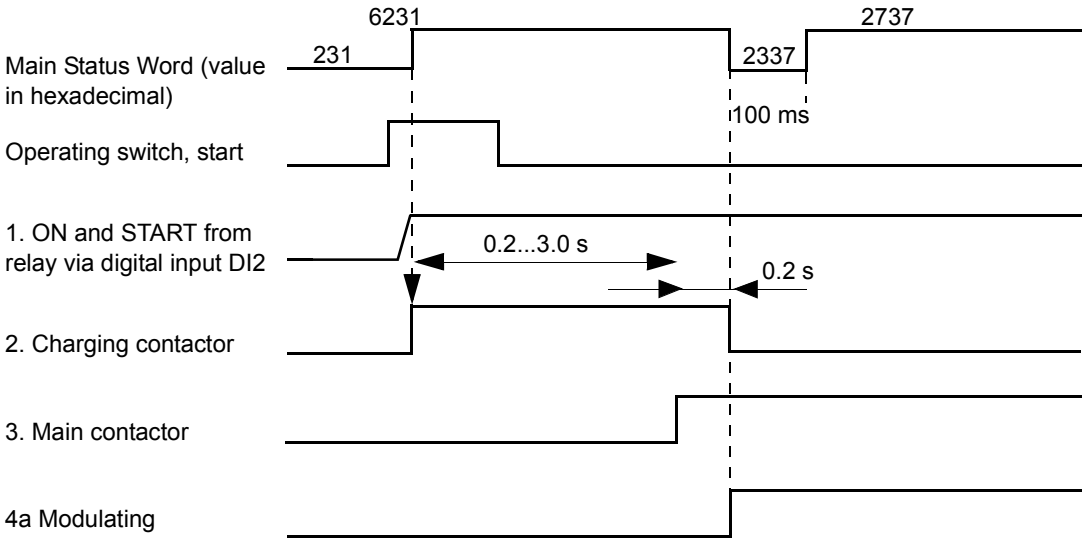
Starting sequence

During the charging procedure the main contactor is closed followed by the Line-side Identification and synchronisation routines. When they are completed, the modulator starts and the line-side converter operates normally.

For description of the starting procedure, see the following sections: *Start by the operating switch (I/O control)*, *Start in local control mode* and *Start via fieldbus*.

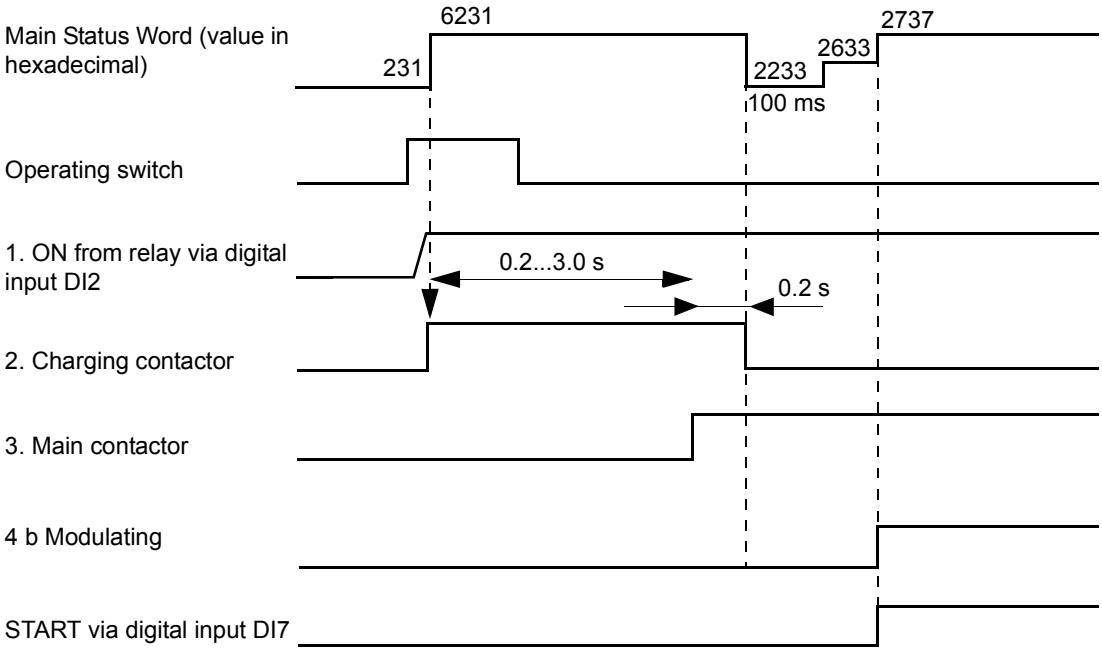
Start by the operating switch (I/O control)

By default, the control commands (ON/OFF/START) of the line-side converter are given by the three-position operating switch on the cabinet door which is wired to digital input DI2. The starting sequence is as follows:



Step	Function
1.	Line-side converter receives the ON and START commands (DI2 rising edge) from the starting switch.
2.	Line-side converter closes the charging contactor control circuit (RO1).
3.	Line-side converter closes the main contactor and the cooling fan control circuit (RO3) and receives the “main contactor on” acknowledgement (DI3) and the “cooling air fan in operation” acknowledgement (DI1).
4 a	Line-side converter synchronises itself to the supply network if the DC voltage level is acceptable (charging is completed successfully). Line-side converter starts modulation and opens the charging contactor control circuit (RO1). The inverter units can be started.
4 b	If parameter 16.01 RUN SELBIT is set to DI7, the ON command is given via digital input DI2 and the START command is given via digital input DI7. Line-side converter starts modulation and the inverter units can be started. See the following starting sequence figure.
0.2...3.0 s = Charging time. Charging time is shorter if the DC link is charged before start. 0.2 s = Start delay	

When the ON command is given via digital input DI2 and the START command is given via digital input DI7, the starting sequence is as follows.



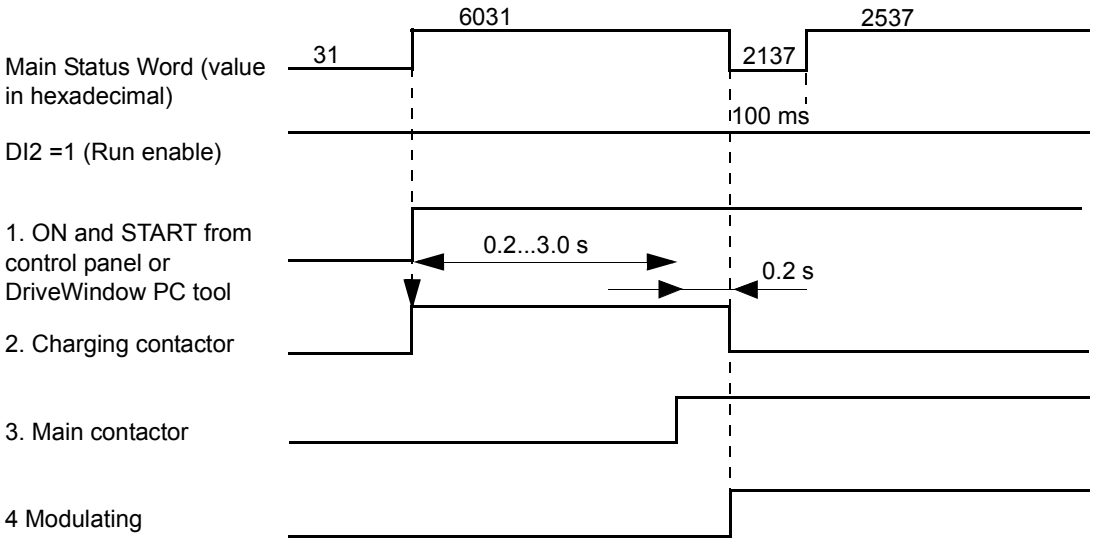
Start in local control mode

Local control mode is mainly used during commissioning and maintenance. The control mode is selected with the LOC/REM key on the CDP 312R control panel or with the DriveWindow PC tool.

Intermediate circuit DC voltage reference 23.01 DC VOLT REF is given from the control panel (REF key) unless analogue input is selected as the reference source by parameter 11.01 DC REF SELECT. Reactive power reference is given by parameter 24.01 Q POWER REF unless analogue input is selected as the reference source by parameter 11.02 Q REF SELECT.

Note: Run enable signal should be on before the start command is issued (i.e. DI2 = 1).

The starting sequence is as follows:

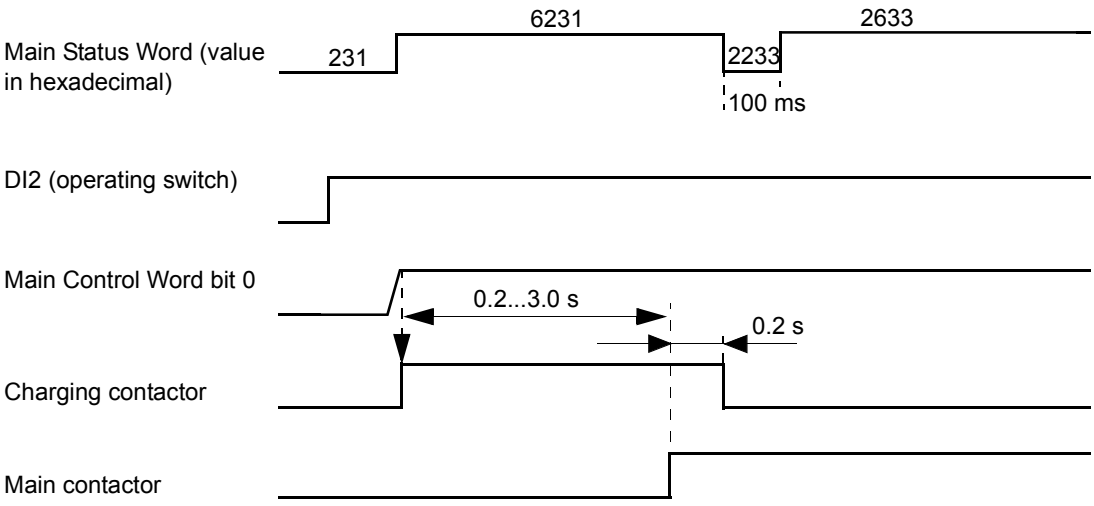


Step	Function
1.	Line-side converter receives the ON and START commands from the control panel or DriveWindow PC tool.
2.	Line-side converter closes the charging contactor control circuit (RO1).
3.	Line-side converter closes the main contactor and the cooling fan control circuit (RO3) and receives the “main contactor on” acknowledgement (DI3) and the “cooling air fan in operation” acknowledgement (DI1).
4.	Line-side converter synchronises itself to the supply network if the DC voltage level is acceptable (charging is completed successfully). Line-side converter starts modulation and opens the charging contactor control circuit (RO1). The inverter units can be started.
0.2...3.0 s = Charging time. Charging time is shorter if the DC link is charged before start. 0.2 s = Start delay	

Start via fieldbus

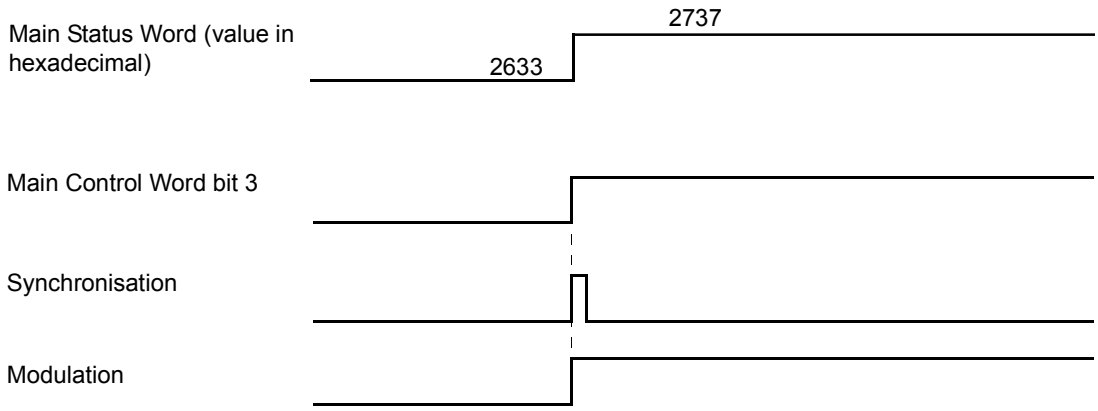
The fieldbus control can be activated by a parameter (parameter group 98 OPTION MODULES). The DC bus charging and the modulator start can be controlled separately.

When the fieldbus control is active, the DC bus charging can be controlled by a rising edge of Main Control Word (MCW) bit 0 **and** simultaneous high level of digital input DI2 (i.e. the operating switch on the cabinet door turned first to position START and thereafter left to position 1).



0.2...3.0 s = Charging time. Charging time is shorter if the DC link is charged before start.
0.2 s = Start delay

The modulator is started by high level of Main Control Word (MCW) bit 3 and stopped by low level of bit 3. The modulator can be started only after the charging of the DC bus is completed.



For more information on fieldbus communication, see chapter *Fieldbus control*.

Settings and diagnostics

Parameters	Description
16.01	Selection of the source for the ON and START commands in I/O control
11.01 and 23.01	DC reference
11.02 and 24.01	Reactive power reference
98.01	Selection of the control command interface(s)
98.02	Activation of the fieldbus control
Actual signals	
07.01 MAIN CNTRL WORD	Status of the Main Control Word bits
08.01 MAIN STATUS WORD	Status of the Main Status Word bits

Stop

A stop signal (DI2 = 0) from the cabinet door switch stops the modulator and opens the main contactor. A stop command can also be given in local control mode by pressing the Stop key ( ) on the control panel or DriveWindow PC tool.

The modulator can be stopped in remote control mode through an external control system. This function does not open the main contactor. The line-side converter only shifts to the 6-pulse diode bridge mode (no regenerative braking is allowed/ possible).

Missing phase

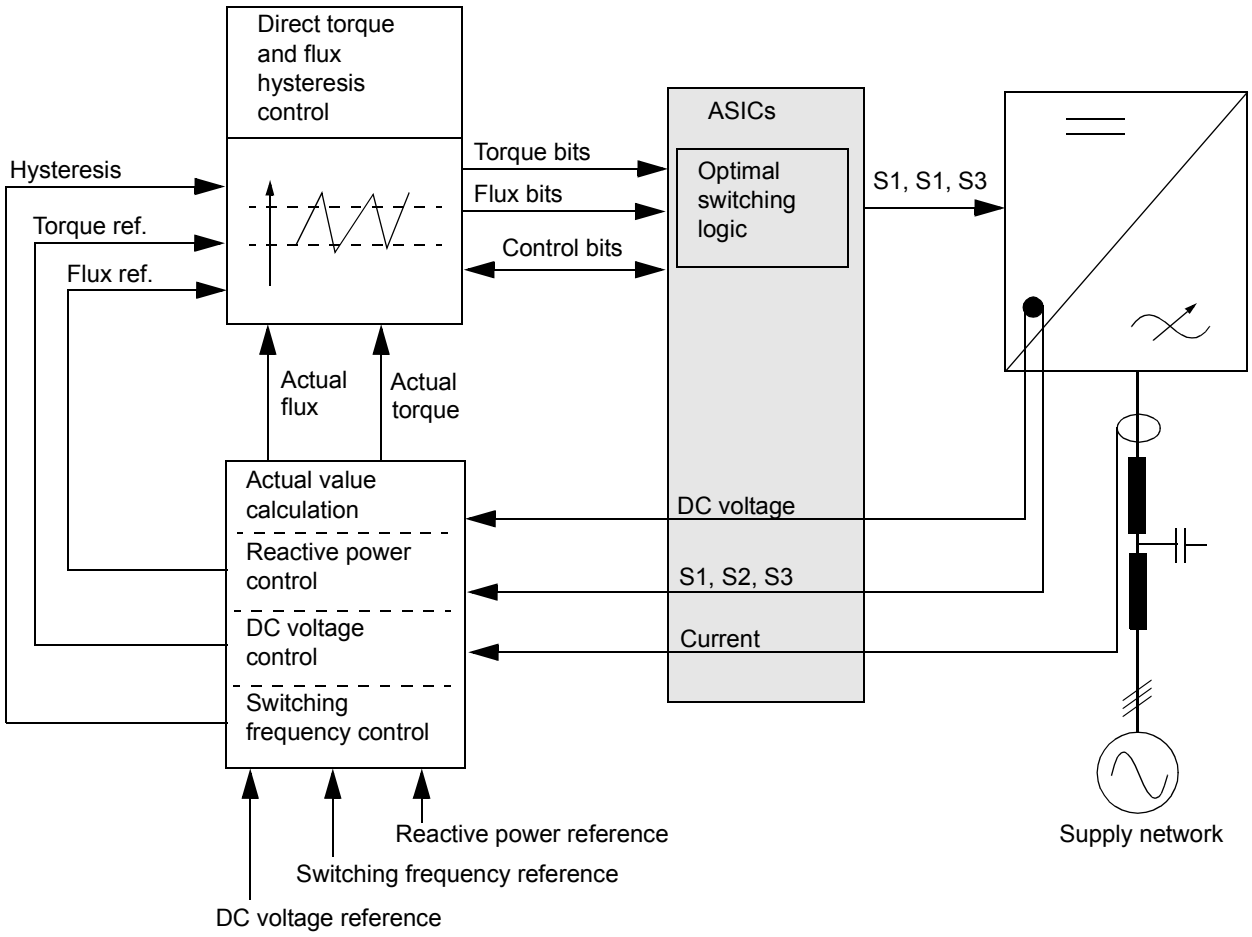
A missing phase is detected by means of AC current and calculated line frequency. When the line-side converter detects that the AC current has been below a fixed limit for 1.5 milliseconds or that the calculated line frequency has exceeded the defined minimum and maximum frequency limits, an alarm is generated. Modulation stops but the main contactor/breaker remains closed. The line-side converter tries to resynchronise as long as the DC voltage is higher than the DC undervoltage trip limit. The resynchronising checks are made at 20 ms intervals. If the voltage in the DC link falls below the limit, the line-side converter will open the main contactor/breaker and trip on DC undervoltage fault.

Settings and diagnostics

Parameters	Description
30.12	DC undervoltage fault trip limit
142.05	Minimum limit for the difference between the line frequency and the initialised value of 50 or 60 Hz. With default value 5 Hz, the minimum frequency limit equals to 50 Hz - 5 Hz = 45 Hz (or 60 Hz - 5 Hz = 55 Hz).
142.06	Maximum limit for the difference between the line frequency and the initialised value of 50 or 60 Hz. With default value 5 Hz, the maximum frequency limit equals to 50 Hz + 5 Hz = 55 Hz (or 60 Hz + 5 Hz = 65 Hz).
Actual signals	
01.05	Calculated line frequency
Warnings	
NET LOST	Supply loss
Faults	
DC UNDERVOLT (3220)	Undervoltage trip

Control diagram

A block diagram of the measurements and the principles of the line-side converter control program is shown below. S1, S2 and S3 denote the power switches.



Controllers

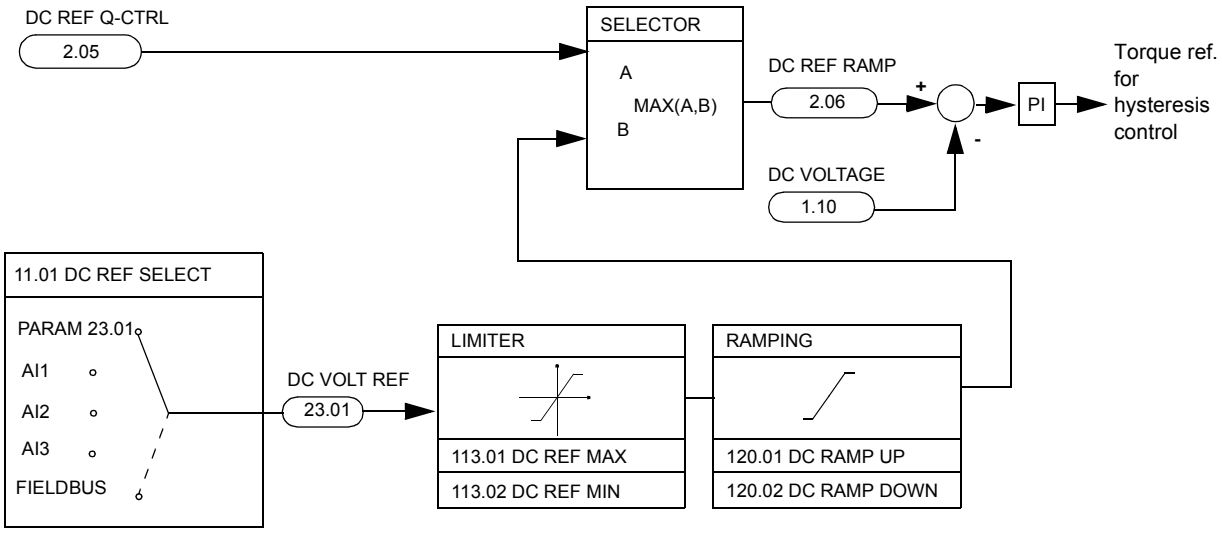
The control includes four main controllers:

- torque and flux hysteresis controllers
- DC voltage and reactive power controllers.

On the basis of measurements, the following four items are calculated:

- actual value for flux
- actual value for torque
- actual value for reactive power
- estimate for frequency.

DC voltage control



DC voltage controller keeps the DC voltage in a preset reference in all load conditions. The controller input, i.e. the error value between the reference and the actual measured value, is calculated from DC voltage measurement and ramped and limited DC references. The output of the DC voltage PI controller is the torque reference for hysteresis control.

There are two reference values for the DC voltage control:

- user-given DC voltage reference (a parameter)
- minimum DC voltage reference (calculated by reactive power controller).

In normal mode, the ramped value of the user-defined reference is used. If it is below the minimum DC voltage reference, the minimum reference is used instead.

The controller parameters are tuned by default. There is no need to reset them.

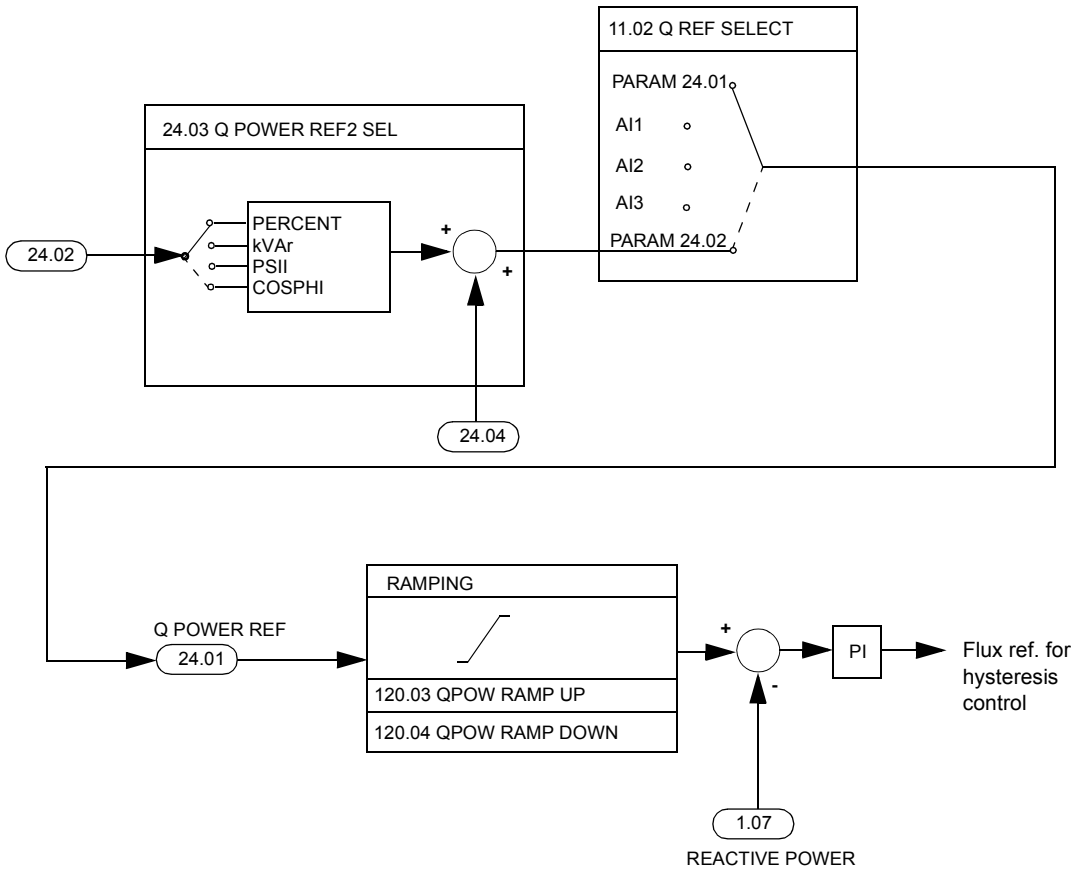
Settings and diagnostics

Parameters	Description
11.01	DC voltage reference source
23.01	User-given reference
113.01	Maximum DC voltage reference limit = 1.1 · sqrt(2) · parameter 04.04.
113.02	Minimum DC voltage reference limit = 0.65 · sqrt(2) · parameter 04.04.
120.01	DC voltage reference ramp time from 0 to sqrt(2) · parameter 04.04. Default value is 1 s.
120.02	DC voltage reference ramp time from sqrt(2) · parameter 04.04 to 0. Default value is 1 s.
Actual signals	
01.10 (160.04)	Actual DC voltage
02.05	Reference from reactive power control
02.06	Ramped and limited DC voltage reference

Reactive power control

Reactive power control is capable of generating a preset amount of reactive power to the network (positive = capacitive, negative = reactive) by changing the flux length. This can be set by a parameter. As default no reactive power is generated.

When the flux length exceeds the network flux length, capacitive power is generated to the network and vice versa. Increased flux means that the AC voltage of the line-side converter is higher than the network voltage.



Settings and diagnostics

Parameters	Description
11.02, 24.01, 24.02, 24.04	Reactive power to be generated to network
24.03	Selection of the reference unit
120.03	Reactive power reference ramp up time from 0 kVAr to the absolute value of the converter nominal power (parameter 04.06). Default value is 1 s.
120.04	Reactive power reference ramp down time from the absolute value of the converter nominal power (parameter 04.06) to 0 kVAr. Default value is 1 s.
Actual signals	
01.07	Calculated reactive power

Reduced Run Function

Reduced Run Function is available for parallel connected converters, 2...12 · R8i.

Reduced Run Function makes it possible to continue the operation with limited current if a converter module(s) is out of order. If one of the modules is broken, it must be removed. Parameter change is needed to continue the run with reduced current.

Removing a broken converter module

Note: The number of removed converters is restricted with the following rules:

- Maximum number of removed converters is limited to 50% of the original number of parallel connected converters.

AND

- When two converters share a common line filter, both of them need to be removed, if one of them is out of order.

Original number of parallel converters	Number of converters which can be removed
2	1
3	1
4	2
6	2
8	2 or 4
10	2 or 4
12	2 or 4 or 6

WARNING! The safety instructions must be followed. See the safety instructions on the first pages of the appropriate hardware manual or for multidrive, see *ACS800 Multidrive Safety Instructions* [3AFE64760432 (English)].

- Disconnect the supply voltage and all auxiliary voltages from the drive.
- Remove the broken converter module from the cabinet. See appropriate hardware manual.
- If the broken module has a common filter unit with another module, remove both modules. Exception: If there are only two or three modules, only one of the modules can be removed.
- Fasten the air baffle provided with the unit to the top module guide to block airflow through the empty module space.
- Switch on the supply voltage. INT CONFIG fault now indicates that the number of connected converter modules has changed.

- If the operation is continued with limited current, number of existing converter modules must be set to parameter 16.10 INT CONFIG USER.
- Reset the fault and start the converter. PPCS link is reconfigured automatically during DC link charging and parameter 24.01 Q POWER REF range is limited according to the new configuration.

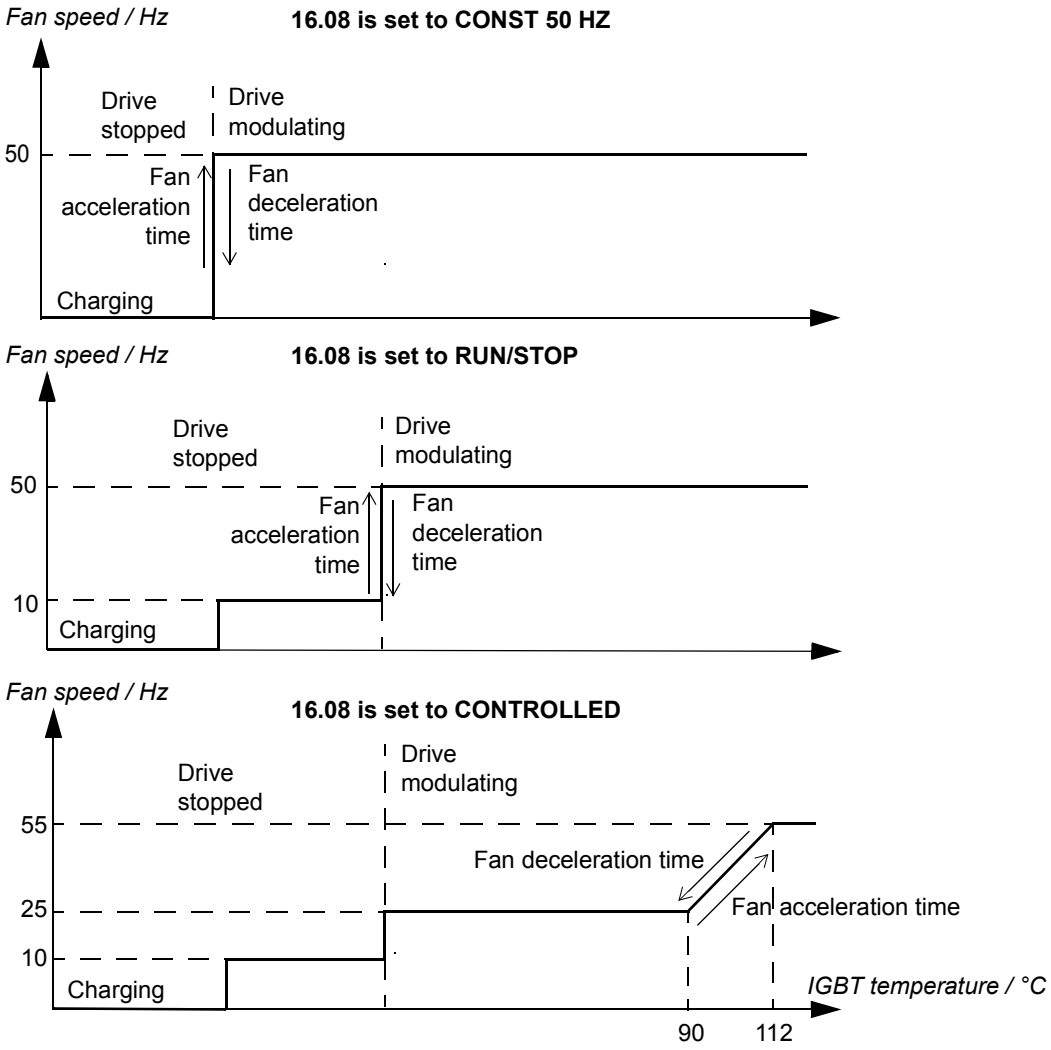
Note: If INT CONFIG fault reappears, the number of parallel connected converters defined by parameter 16.10 INT CONFIG USER is incorrect. See signal 08.22 INT CONFIG WORD.

Settings and diagnostics

Parameters	Description
16.10	Number of parallel connected converters
24.01	Reactive power generation reference
Actual signals	
08.22	Converters recognised by the application program

Inverter fan speed control

Converter modules can be equipped with an optional inverter fan. The fan speed can be controlled by adjusting the fan speed control parameters. The following figures present the different fan speed control curves.



Settings

Parameters	Description
16.08	Selection of the inverter fan speed control

RMIO board connection diagrams

Default cable connections to the RMIO board are shown below. For ACS800-11/U11 line-side converter RMIO connections, see page 29.

Terminal block size:
cables 0.3 to 3.3 mm^2 (22 to 12 AWG)
Tightening torque:
0.2 to 0.4 Nm (2 to 4 lbf in.)

X20

1	VREF-	Reference voltage -10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	GND	

X21

1	VREF+	Reference voltage 10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	GND	
3	AI1+	By default, not in use. 0(2)...10 V, R_{in} > 200 kohm
4	AI1-	
5	AI2+	By default, not in use. 0(4)...20 mA, R_{in} = 100 ohm
6	AI2-	
7	AI3+	By default, not in use. 0(4)...20 mA, R_{in} = 100 ohm
8	AI3-	
9	AO1+	By default, not in use. 0(4)...20 mA, R_L ≤ 700 ohm
10	AO1-	
11	AO2+	By default, not in use. 0(4)...20 mA, R_L ≤ 700 ohm
12	AO2-	

[1] non-programmable I/O

[2] External earth (ground) fault indication via digital input DI4: See parameter 30.04 EXT EARTH FAULT.

[3] External alarm/fault indication via digital input DI5: See parameter 30.05 EXT EVENT.

[4] START command via digital input DI7: See parameter 16.01 RUN BIT SEL.

X22

1	DI1	Acknowledgement of converter fan [1]
2	DI2	Stop/Start
3	DI3	Acknowledgement from main contactor [1]
4	DI4	By default, not in use. [2]
5	DI5	By default, not in use. [3]
6	DI6	Reset [1]
7	+24V	+24 VDC max. 100 mA
8	+24V	
9	DGND	Digital ground
10	DGND	Digital ground
11	DI7(DIIL)	By default, not in use. [4]

X23

1	+24V	Auxiliary voltage output, non-isolated, 24 VDC 250 mA
2	GND	

X25

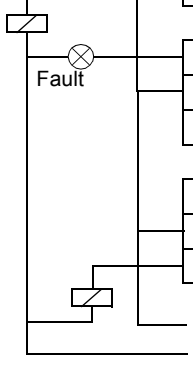
1	RO11	Relay output 1: Charging contactor control [1]
2	RO12	
3	RO13	

X26

1	RO21	Relay output 2: fault (-1)
2	RO22	
3	RO23	

X27

1	RO31	Relay output 3: Main contactor control [1]
2	RO32	
3	RO33	



Default cable connections to the RMIO board for the ACS800-11/U11 line-side converter are shown below.

Terminal block size:
cables 0.3 to 3.3 mm^2 (22 to 12 AWG)
Tightening torque:
0.2 to 0.4 Nm (2 to 4 lbf in.)

X20

1	VREF-	Reference voltage -10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	GND	

X21

1	VREF+	Reference voltage 10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	GND	
3	AI1+	By default, not in use. 0(2)...10 V, R_{in} > 200 kohm
4	AI1-	
5	AI2+	By default, not in use. 0(4)...20 mA, R_{in} = 100 ohm
6	AI2-	
7	AI3+	By default, not in use. 0(4)...20 mA, R_{in} = 100 ohm
8	AI3-	
9	AO1+	By default, not in use. 0(4)...20 mA, R_L ≤ 700 ohm
10	AO1-	
11	AO2+	By default, not in use. 0(4)...20 mA, R_L ≤ 700 ohm
12	AO2-	

X22

1	DI1	Acknowledgement of converter fan [1]
2	DI2	Stop/Start
3	DI3	Acknowledgement from main contactor [1]
4	DI4	By default, not in use. [2]
5	DI5	By default, not in use. [3]
6	DI6	By default, not in use.
7	+24V	+24 VDC max. 100 mA
8	+24V	
9	DGND	Digital ground
10	DGND	Digital ground
11	DI7(DIIL)	By default, not in use. [4]

X23

1	+24V	Auxiliary voltage output, non-isolated, 24 VDC 250 mA
2	GND	

X25

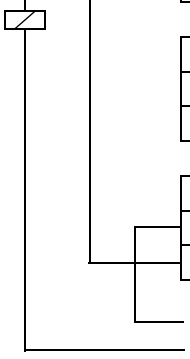
1	RO11	Relay output 1: By default, not in use.
2	RO12	
3	RO13	

X26

1	RO21	Relay output 2: By default, not in use.
2	RO22	
3	RO23	

X27

1	RO31	Relay output 3: Main contactor control [1]
2	RO32	
3	RO33	



[1] non-programmable I/O

[2] External earth (ground) fault indication via digital input DI4: See parameter 30.04 EXT EARTH FAULT.

[3] External alarm/fault indication via digital input DI5: See parameter 30.05 EXT EVENT.

[4] START command via digital input DI7: See parameter 16.01 RUN BIT SEL.

Actual signals and parameters

What this chapter contains

This chapter describes the actual signals and parameters. The chapter also lists the fieldbus equivalents, data types and default values.

Note: Parameter values do not need to be set in normal use!

Fieldbus equivalent

Fieldbus equivalent defines the scaling between the value used in the converter control program and the integer used in serial communication.

Fieldbus addresses

Type Rxxx adapter modules (such as RPBA, RCAN, etc.): See the appropriate user's manual.

Interbus-S NIBA-01 module:

• xxyy · 100 + 12288 converted into hexadecimal (xx = parameter number and yy = subindex).

Example: The index for drive parameter 13.09 is 1309 + 12288 = 13597 = 351D (hex).

Modbus and Modbus Plus address

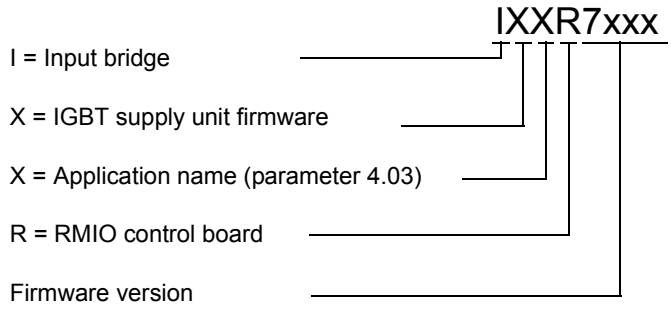
The drive parameter and dataset information are mapped into the 4xxyy (where xxyy = drive parameter number) register area. This holding register can be read from an external device, which can modify the register values by writing into them.

There are no setup parameters for mapping the data to the 4xxyy registers. The mapping is pre-defined and corresponds directly to the drive parameter grouping which is being used by the local drive panel.

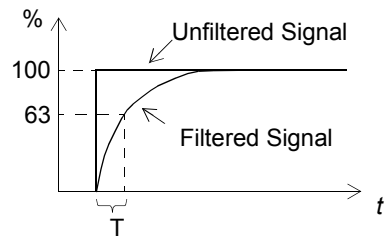
Terms and abbreviations

Term	Definition
Actual signal	Signal measured or calculated by the converter. Can be monitored by the user. No user setting possible.
B	Boolean
C	Character string
Def.	Default value
FbEq	Fieldbus equivalent: the scaling between the value shown on the panel and the integer used in serial communication
I	Integer
R	Real
T.	Data type (see B, C, I, R)

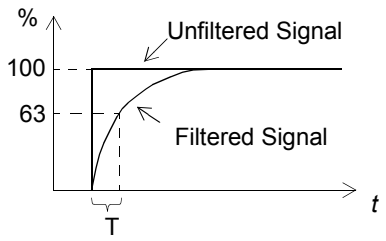
No.	Name/Value	Description	FbEq / T.
01 ACTUAL SIGNALS			
01.05	FREQUENCY	Calculated line frequency [Hz]	100 = 1 Hz
01.06	LINE CURRENT	Measured line current [A]	1 = 1 A
01.07	REACTIVE POWER	Calculated reactive power (positive = capacitive, negative = reactive) [kVar]	1 = 1 kVAr
01.08	POWER	Calculated line-side converter power (positive = power flow from supply network to intermediate circuit, negative = power flow from intermediate circuit to supply network) [kW]	1 = 1 kW
01.09	POWER	Input power in percent of the nominal value (parameter 04.06 CONV NOM POWER) [%]	100 = 1%
01.10	DC VOLTAGE	Measured intermediate circuit voltage [V]	1 = 1 V
01.11	MAINS VOLTAGE	Calculated input voltage [V]	1 = 1 V
01.12	ACS800 TEMP	IGBT temperature [°C]	1 = 1°C
01.13	TIME OF USAGE	Elapsed time counter. Runs when the RMIO board is powered. [h]	1 = 1 h
01.14	KWH SUPPLY	Counts the kilowatt hours of operation (= 01.16 KWH MOTORING - 01.17 KWH GENERATING). [kWh] The counter can be reset by parameter 16.09 RESET COUNTER.	1 = 100 kWh
01.15	DI7-1 STATUS	Status of digital inputs DI7 to DI1. 0 VDC = “0” +24 VDC = “1”. Example: Control panel display when digital inputs DI1 and DI4 are activated is 0001001, where the digits for digital inputs are read from right to left (DI1 to DI7).	1 = 1
01.16	KWH MOTORING	Counts the kilowatt hours of motoring (power flow from supply network to intermediate circuit). [kWh] The counter can be reset by parameter 16.09 RESET COUNTER.	1 = 100 kWh
01.17	KWH GENERATING	Counts the kilowatt hours of regenerative braking (power flow from intermediate circuit to supply network). [kWh] The counter can be reset by parameter 16.09 RESET COUNTER.	1 = 100 kWh
01.19	AI1 [V]	Non-scaled value of analogue input AI [V]. See parameters 13.01 AI1 HIGH VALUE and 13.02 AI1 LOW VALUE.	10000 = 10 V or 20 mA
01.20	AI2 [mA]	Non-scaled value of analogue input AI2 [mA]. See parameters 13.04 AI2 HIGH VALUE and 13.05 AI2 LOW VALUE.	20000 = 20 mA, 2 V or 10 V
01.21	AI3 [mA]	Non-scaled value of analogue input AI3 [mA]. See parameters 13.08 AI3 HIGH VALUE and 13.09 AI3 LOW VALUE.	20000 = 20 mA
01.22	RO3-1 STATUS	Status of the standard I/O board relay outputs Example: Control panel display when relay outputs 2 and 3 are activated is 0000110, where the digits are read from right to left (RO1 to RO3)	1 = 1
01.23	AO1	Value of analogue output 1 signal [mA]. See parameter group 15 ANALOGUE OUTPUTS for signal selection and scaling.	20000 = 20 mA
01.24	AO2	Value of analogue output 2 signal [mA]. See parameter group 15 ANALOGUE OUTPUTS for signal selection and scaling.	20000 = 20 mA
01.26	LED PANEL OUTP	NLMD-01 LED panel output [%]. See parameter group 18 LED PANEL CTRL.	1 = 1
01.27	COSFII	Calculated cosfii	100 = 1

No.	Name/Value	Description	FbEq / T.
01.30	BREAKER COUNTER	Main contactor/breaker counter. Counts the times the main contactor/breaker has been closed. The counter can be reset by parameter 16.09 RESET COUNTER.	1 = 1
01.31	FAN ON-TIME	Running time of the converter cooling fan [h] The counter can be reset by parameter 16.09 RESET COUNTER. Resetting is recommended when the fan is replaced.	1 = 1
02 ACTUAL SIGNALS			
02.05	DC REF Q-CTRL	Minimum voltage reference of intermediate circuit calculated by reactive power control [V]	1 = 1 V
02.06	DC REF RAMP	Ramped and limited intermediate circuit voltage reference for power control [V]	1 = 1 V
02.07	DC REF INITIALIZ	Initialised intermediate circuit voltage reference based on Line-side Identification [V]. The voltage reference is calculated from DC voltage measurement and is approximately sqrt(2) · supply network voltage.	1 = 1 V
03 ACTUAL SIGNALS		Monitoring signals	
03.12	PP 1 TEMP	Measured IGBT temperature of converter no. 1 [ºC]	1 = 1ºC
03.13	PP 2 TEMP	Measured IGBT temperature of converter no. 2 [ºC]	1 = 1ºC
03.14	PP 3 TEMP	Measured IGBT temperature of converter no. 3 [ºC]	1 = 1ºC
03.15	PP 4 TEMP	Measured IGBT temperature of converter no. 4 [ºC]	1 = 1ºC
03.18	TEMP DIF MAX	Maximum phase temperature difference [ºC]. Measured from all phases.	1 = 1ºC
03.19	PHASE U TEMP DIF	Temperature difference between individual module phase U and the average temperature of the rest of the modules [ºC]	1 = 1ºC
03.20	PHASE V TEMP DIF	Temperature difference between individual module phase V and the average temperature of the rest of the modules [ºC]	1 = 1ºC
03.21	PHASE W TEMP DIF	Temperature difference between individual module phase W and the average temperature of the rest of the modules [ºC]	1 = 1ºC
04 INFORMATION		Program versions, converter ratings	
04.01	SW PACKAGE VER	Displays the type and version of the firmware package in the converter. Decoding key:  	-; C
04.02	DTC VERSION	Line-converter control software version. This fixed part of the application program consists of line-converter control, operational system, communication control of the DDCS channels, and Modbus software of the control panel.	-; B
04.03	APPLIC NAME	Displays the type and version of the application program.	-; C
04.04	CONV NOM VOLTAGE	Downloaded nominal supply voltage of the converter [V]	1 = 1 V; R

No.	Name/Value	Description	FbEq / T.
04.05	CONV NOM CURRENT	Downloaded nominal line current of the converter [A]	1 = 1 A; R
04.06	CONV NOM POWER	Converter nominal power [kW]	1 = 1 kW; R
04.07	CONV MAX VOLTAGE	Maximum value of converter voltage measurement range [V]	1 = 1 V; R
04.08	CONV MAX CURRENT	Maximum value of converter current measurement range [A]	1 = 1 A; R
04.09	INVERTER TYPE	Converter type	-; C
04.10	APBU EPLD VERSION	APBU branching unit logic version. Default: NO LOGIC.	-; C
07 CONTROL WORDS			
07.01	MAIN CTRL WORD	16-bit data word. See chapter *Fieldbus control*.	
08 STATUS WORDS			
08.01	MAIN STATUS WORD	16-bit data word. See chapter *Fieldbus control*.	
08.22	INT CONFIG WORD	16-bit data word. Number of converter units recognised by the application during PPCC link initialisation. Bit 0 = INT1 = Converter 1 INT board ... Bit 11 = INT12 = Converter 12 INT board	
09 FAULT WORDS			
09.01	FAULT WORD 1	16-bit data word. See chapter *Fieldbus control*.	
09.02	FAULT WORD 2	16-bit data word. See chapter *Fieldbus control*.	
09.11	SUPPLY FAULT WORD	16-bit data word. See chapter *Fieldbus control*.	
09.12	SUPPLY ALARM WORD	16-bit data word. See chapter *Fieldbus control*.	
09.13	CURRENT UNBALANCE	16-bit data word. See chapter *Fieldbus control*.	
09.14	OVERCURRENT FAULT	16-bit data word. See chapter *Fieldbus control*.	
09.15	SHORT CIRC FAULT	16-bit data word. See chapter *Fieldbus control*.	
09.16	OVERTEMP WORD	16-bit data word. See chapter *Fieldbus control*.	
09.17	TEMP DIF FLT WORD	16-bit data word. See chapter *Fieldbus control*.	
09.18	TEMP DIF ALM WORD	16-bit data word. See chapter *Fieldbus control*.	
09.30	FAULT CODE 1 LAST	Fieldbus code of the latest fault. See chapter *Fault tracing*.	
09.31	FAULT CODE 2 LAST	Fieldbus code of the 2nd latest fault	
09.32	FAULT CODE 3 LAST	Fieldbus code of the 3rd latest fault	
09.33	FAULT CODE 4 LAST	Fieldbus code of the 4th latest fault	
09.34	FAULT CODE 5 LAST	Fieldbus code of the 5th latest fault	
09.35	WARN CODE 1 LAST	Fieldbus code of the latest warning	
09.36	WARN CODE 2 LAST	Fieldbus code of the 2nd latest warning	
09.37	WARN CODE 3 LAST	Fieldbus code of the 3rd latest warning	
09.38	WARN CODE 4 LAST	Fieldbus code of the 4th latest warning	
09.39	WARN CODE 5 LAST	Fieldbus code of the 5th latest warning	

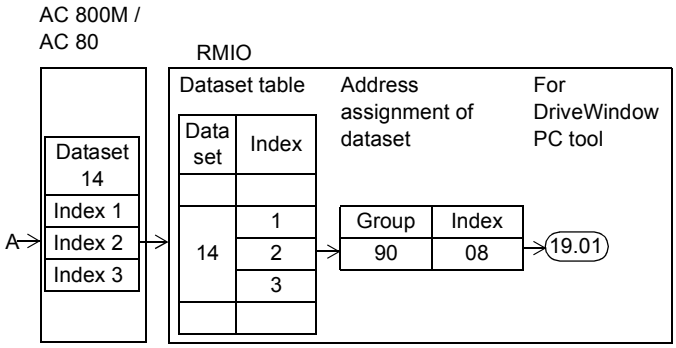
No.	Name/Value	Description	T./FbEq	Def.
11 REFERENCE SELECT		Reference sources		
11.01	DC REF SELECT	Defines the source for the intermediate circuit DC voltage reference. **Note:** Value is automatically set to FIELDBUS if parameter 98.02 COMM. MODULE is set to INVERTER.	I	PARAM 23.01
	PARAM 23.01	Value of parameter 23.01 DC VOLT REF	1	
	AI1	Analogue input AI1	2	
	AI2	Analogue input AI2	3	
	AI3	Analogue input AI3	4	
	FIELDBUS	23.01 DC VOLT REF from dataset. See section *Block diagram: reference select* on page *65*.	5	
11.02	Q REF SELECT	Defines the source for the reactive power reference. **Note:** Value is automatically set to PARAM 24.02 if parameter 98.02 COMM. MODULE is set to INVERTER.	I	PARAM 24.01
	PARAM 24.01	Value of parameter 24.01 Q POWER REF	1	
	AI1	Analogue input AI1	2	
	AI2	Analogue input AI2	3	
	AI3	Analogue input AI3	4	
	PARAM 24.02	Value of parameter 24.02 Q POWER REF2	5	
13 ANALOGUE INPUTS		Analogue input signal processing		
13.01	AI1 HIGH VALUE	Defines the integer value used in serial communication that corresponds to the maximum value of analogue input AI1.	I	20000
	-32768...32767	Integer value		
13.02	AI1 LOW VALUE	Defines the integer value used in serial communication that corresponds to the minimum value of analogue input AI1.	I	0
	-32768...32767	Integer value		
13.03	FILTER AI1	Defines the filter time constant for analogue input AI1. The hardware filter time constant (with RMIO) is 20 ms (fixed, cannot be altered).	R	1000 ms
	0...30000 ms	Filter time constant  $O = I \cdot (1 - e^{-t/T})$ I = filter input (step) O = filter output t = time T = filter time constant	1 = 1 ms	
13.04	AI2 HIGH VALUE	Defines the integer value used in serial communication, that corresponds to the maximum value of analogue input AI2.	I	0
	-32768...32767	Integer value		
13.05	AI2 LOW VALUE	Defines the integer value used in serial communication, that corresponds to the minimum value of analogue input AI2 (0 or 4 mA).	I	0
	-32768...32767	Integer value		

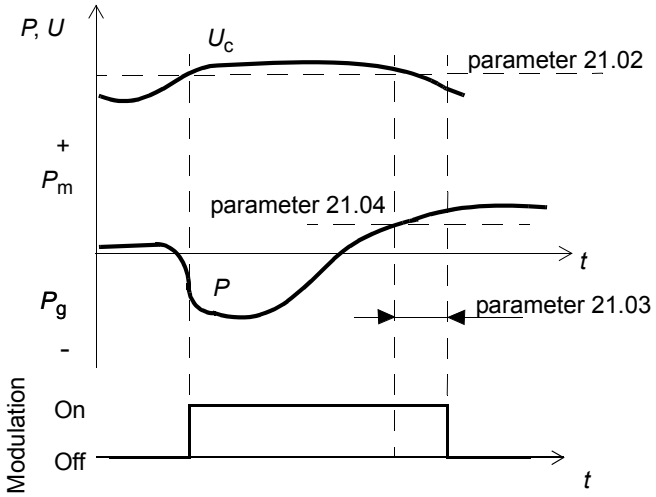
No.	Name/Value	Description	T./FbEq	Def.
13.06	MINIMUM AI2	Defines the minimum value for analogue input AI2.	I	0 mA
	0 mA	Zero milliamperes	1	
	4 mA	Four milliamperes	2	
13.07	FILTER AI2	Defines the filter time constant for analogue input AI2. The hardware filter time constant (with RMIO) is 20 ms (fixed, cannot be altered).	R	1000 ms
	0...30000 ms	Filter time constant. See parameter 13.03 FILTER AI1.	1 = 1 ms	
13.08	AI3 HIGH VALUE	Defines the integer value used in serial communication that corresponds to the maximum value of analogue input AI3 (20 mA).	I	10000
	-32768...32767	Integer value		
13.09	AI3 LOW VALUE	Defines the integer value used in serial communication that corresponds to the minimum value of analogue input AI3 (0 or 4 mA).	I	0
	-32768...32767	Integer value		
13.10	MINIMUM AI3	Defines the minimum value for analogue input AI3.	I	0 mA
	0 mA	Zero milliamperes	1	
	4 mA	Four milliamperes	2	
13.11	FILTER AI3	Defines the filter time constant for analogue input AI3. The hardware filter time constant (with RMIO) is 20 ms.	R	1000 ms
	0...30000 ms	Filter time constant. See parameter 13.03 FILTER AI1.	1 = 1 ms	
13.12	MINIMUM AI1	Defines the minimum value for analogue input AI1.	I	0 V
	0 V	Zero volts	1	
	-10 V	- ten volts	2	
14 DIGITAL OUTPUTS		Relay output control		
14.04	DO2 GROUP+INDEX	Selects relay output RO2 control signal. Output is controlled with a selectable bit (see parameter 14.05 DO2 BIT NUMBER) of the signal selected by this parameter. Example: When bit number 0 (RDY_ON) of parameter 08.01 MAIN STATUS WORD is selected to control relay output R02, the value of parameter 14.04 is set to 801, where 8 indicates the group number and 01 the index of the selected signal. The bit number is specified with parameter 14.05 DO2 BIT NUMBER.	I	801
	-19999...-19999	Parameter index 801 denotes signal 08.01. **Note**: Inversion of the output is set with a minus sign, i.e. -801.		
14.05	DO2 BIT NUMBER	Defines the bit number of the signal selected by parameter 14.04 DO2 GROUP+INDEX.	I	0
	0...15	Bit number		
15 ANALOGUE OUTPUTS		Output signal processing		
15.01	ANALOGUE OUTPUT 1	Connects a measured signal to analogue output AO1. An external control system can also control the output. The dataset in which the signal is transmitted to the converter is directed into one of the data parameters (19.01...19.08) using parameters 90.01...90.18. The data parameter is then coupled to the analogue output with this parameter.	I	0
	0...30000	Parameter index 109 denotes signal 01.09 POWER.		

No.	Name/Value	Description	T./FbEq	Def.
15.02	INVERT AO1	Activates analogue output AO1 signal inversion.	B	NO
	NO	Inversion inactive. Minimum signal value corresponds to the minimum output value.	0	
	YES	Inversion active. Maximum signal value corresponds to the minimum output value.	1	
15.03	MINIMUM AO1	Defines the minimum value for analogue output AO1.	I	0 mA
	0 mA	Zero milliamperes	1	
	4 mA	Four milliamperes	2	
	10 mA	Ten milliamperes	3	
15.04	FILTER AO1	Defines the filter time constant for analogue output AO1.	R	0.10 s
	0.00...10.00 s	Filter time constant  $O = I \cdot (1 - e^{-t/T})$ I = filter input (step) O = filter output t = time T = filter time constant	100 = 1.00 s	
15.05	SCALE AO1	Defines the nominal value of the signal connected to analogue output AO1. See parameter 15.01 ANALOGUE OUTPUT 1. The value corresponds to 20 mA at the output. Example: Parameter 01.06 LINE CURRENT is indicated through analogue output AO1. The nominal value of line current is 100 A. This parameter is set to 100 to match the nominal value (100 A) with the analogue output signal maximum (20 mA).	R	100
	0...65536	Real value	1 = 1	
15.06	ANALOGUE OUTPUT 2	Connects a measured signal to analogue output AO2.	I	0
	0...30000	Parameter index 109 denotes signal 01.09 POWER.		
15.07	INVERT AO2	Activates analogue output AO2 signal inversion.	B	NO
	NO	Inversion inactive. Minimum signal value corresponds to the minimum output value.	0	
	YES	Inversion active. Maximum signal value corresponds to the minimum output value.	1	
15.08	MINIMUM AO2	Defines the minimum value for analogue output AO2.	I	0 mA
	0 mA	Zero milliamperes	1	
	4 mA	Four milliamperes	2	
	10 mA	Ten milliamperes	3	
15.09	FILTER AO2	Defines the filter time constant for analogue output AO2. See parameter 15.04 FILTER AO1.	R	0.10 s
	0.00...10.00 s	Filter time constant	100 = 1.00 s	
15.10	SCALE AO2	Defines the nominal value of the signal connected to analogue output AO2. See parameter 15.06 ANALOGUE OUTPUT 2. The value corresponds to 20 mA at the output. See parameter 15.05 SCALE AO1.	R	100
	0...65536	Real value	1 = 1	

No.	Name/Value	Description	T./FbEq	Def.
16 SYSTEM CTR INPUTS		Parameter lock, parameter back-up etc.		
16.01	RUN BIT SEL	Selects the source for commands ON and START in I/O control. See section *Start by the operating switch (I/O control)* on page *16*.	B	DI2
	DI2	ON command via digital input DI2 START command via digital input DI2	0	
	DI7	ON command via digital input DI2 START command via digital input DI7	1	
16.02	PARAMETER LOCK	Selects the state of the parameter lock. The lock prevents parameter changing.	B	OPEN
	LOCKED	Locked. Parameter values cannot be changed from the control panel. The lock can be opened by entering the valid code to parameter 16.03 PASS CODE.	1	
	OPEN	The lock is open. Parameter values can be changed.	0	
16.03	PASS CODE	Selects the pass code for the parameter lock (see parameter 16.02 PARAMETER LOCK).	I	0
	0...30000	Setting 358 opens the lock. The value reverts automatically back to 0.		
16.06	PARAMETER BACKUP	Saves parameters from the RAM memory to the FPROM memory. Saving of parameters is needed only when parameter changes through external control system have to be stored to the FPROM memory. **Note:** Parameter changes by CDP 312R control panel or DriveWindow are immediately saved to the FPROM memory.	I	DONE
	DONE	Parameter saving has been completed.	0	
	SAVE	Parameters are being saved to the FPROM memory.	1	
16.08	FAN SPD CTRL MODE	Selects the inverter fan speed control. Converters can be equipped with an optional controllable inverter fan. See section *Inverter fan speed control* on page *27*.	I	CON-TROLLED
	CONST 50HZ	Fan is running always at constant frequency of 50 Hz when powered.	0	
	RUN/STOP	Fan is running at constant speed of 50 Hz when the drive is running. Fan is running at constant speed of 10 Hz when the drive is stopped.	1	
	CONTROLLED	The speed of the fan is determined from the IGBT temperature vs. the fan speed curve when the drive is running. The speed range is 25...55 Hz. Fan is running at constant speed of 10 Hz when the drive is stopped.	2	
16.09	RESET COUNTER	Resets the selected counter.	I	NO
	NO	No reset. The value automatically restores to NO after a reset.	1	
	BREAKER	Main contactor/breaker counter reset (01.30 BREAKER COUNTER)	2	
	FAN ON TIME	Drive cooling fan running time counter reset (01.31 FAN ON-TIME)	3	
	KWH	kWh counter reset (01.14 KWH SUPPLY, 01.16 KWH MOTORING and 01.17 KWH GENERATING)	4	
16.10	INT CONFIG USER	Number of parallel connected converters. Activates the Reduced Run function. **Note:** The number of disconnected converters is limited. For more information, see section *Reduced Run Function* on page *25*.	R	0
	1...12	Number of parallel connected converters	1 = 1	

No.	Name/Value	Description	T./FbEq	Def.
16.14	POWER SIGN CHANGE	Changes the sign of the power.	B	NO
	NO	No power sign change	0	
	YES	Power sign changed: Signs of signals 01.08 and 01.09 are inverted.	1	
16.15	I/O START MODE	Selects I/O control start mode when parameter 98.01 COMMAND SEL is set to I/O.	B	DI2 EDGE
	DI2 LEVEL	Starts the converter by the level of digital input DI2. The converter starts to modulate and the charging resistors will be by-passed when the converter RMIO board is powered, its digital input DI2 is ON and there are no faults. **Note**: This selection forces the value of parameter 98.01 COMMAND SEL from MCW to I/O if parameter 98.02 COMM. MODULE is set to INVERTER.	0	
	DI2 EDGE	Starts the converter by digital input DI2 rising edge. The converter starts to modulate and the charging resistors will be by-passed.	1	
18 LED PANEL CTRL		The NLMD-01 Monitoring Display has a LED bar to show an absolute real type value. 0 50 100 150% The source and the scale of the display signal are defined by this parameter group. **Note:** If NLMD -01 and CDP 312R Control Panel are used together, actual signal 01.26 LED PANEL OUTPUT must be the first signal in CDP 312R Actual Signal Display Mode. Otherwise the NLMD-01 LED bar display will show an incorrect value.		
18.01	LED PANEL OUTPUT	Selects the signal source for the NLMD-01 Monitoring Display. Example: To show signal 01.09 POWER on the display, set parameter 18.01 to value 109.	I	109
	0...30000	Parameter index 109 denotes signal 01.09 POWER.		
18.02	SCALE PANEL	Defines the value of the signal selected by parameter 18.01 LED PANEL OUTPUT which corresponds to 100% on the LED bar display. Example: Signal 01.05 FREQUENCY is shown on the LED display: At 50 Hz the LED display indicates full value (100%) when: Parameter 18.01 is set to 105. Parameter 18.02 is set to 5000 (= 100 · 50 = 5000, where 100 is the integer scale (FbEq) for signal 01.05).	R	100
	0...65536	Scaling factor	1 = 1	

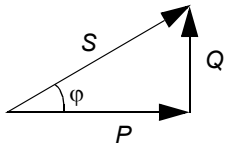
No.	Name/Value	Description	T./FbEq	Def.
19 DATA STORAGE		Parameters for receiving information from or sending to an external control system. The parameters are unconnected and they can be used for linking, testing and commissioning purposes.		
19.01	DATA 1	Stores data written from a user-defined source. Example: Monitor a signal written by an external control system to dataset 14 word 2 using the DriveWindow PC tool as follows: Define the dataset 14 word 2 destination address in the converter application program by setting parameter 90.08 DATA SET 14 VAL 2 to 1901 (points to 19.01 DATA 1.) Set DriveWindow monitoring channel to read parameter 19.01.  A = value assigned from an external control system	R	0
	32768...+32767	Data value	1 = 1	
…	…	…	…	...
19.08	DATA 8	See parameter 19.01.	R	0
	32768...+32767	Data Value	1 = 1	
21 START/STOP		IGBT bridge start and stop logic parameters to be used when there are two different types of power supply units in parallel: a diode supply unit and an IGBT supply unit. With these parameters the IGBT supply unit can be inactivated during the motoring (forward) mode and the drive takes power from the supply only through the diode supply unit. **Note:** These parameters change the normal line-side converter start/stop logic.		
21.01	DC LEVEL START	Activates the DC level start feature. See parameter 21.02 DC VOLTAGE LEVEL. **Note:** DC level start mode is intended only for the generating mode. **Note:** Do not use this feature with ACS800-11/U11/17.	B	
	NO	Inactive	0	NO
	YES	Active. This selection is not recommended for units with an LCL filter. Consult your local ABB representative before setting this parameter to YES.	1	

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>T./FbEq</th><th>Def.</th></tr>
<tr><td>21.02</td><td>DC VOLTAGE LEVEL</td><td>Defines the intermediate circuit DC voltage level at which the modulation starts. The DC level start feature needs to be activated. See parameter 21.01 DC LEVEL START.</td><td>R</td><td>373…
1073 V</td></tr>
<tr><td></td><td>210 … 1174 V</td><td>Voltage level. The default value and setting range vary depending on the value of signal 04.04 CONV NOM VOLTAGE as follows:
<table>
<tr><th>Par. 04.04</th><th>Default of par. 21.02 1)</th><th colspan="2">Range of par. 21.02 2)</th></tr>
<tr><th>[V]</th><th>[V]</th><th>Min. [V]</th><th>Max. [V]</th></tr>
<tr><td>240</td><td>373</td><td>220</td><td>408</td></tr>
<tr><td>415</td><td>646</td><td>380</td><td>706</td></tr>
<tr><td>500</td><td>778</td><td>457</td><td>851</td></tr>
<tr><td>690</td><td>1073</td><td>632</td><td>1174</td></tr>
</table>
1) 1.1 · sqrt(2) · par. 04.04 CONV NOM VOLTAGE
2) (65%...120%) · sqrt(2) · par. 04.04 CONV NOM VOLTAGE</td><td>1 = 1 V</td><td></td></tr>
<tr><td>21.03</td><td>STOP LEVEL TIME</td><td>Defines the time delay for the modulator stop function. The control program stops the IGBT bridge modulation when motoring (forward) power is higher than the limit defined by parameter 21.04 STOP LEVEL POWER for a time defined by this parameter.
The figure below illustrates the modulation control logic.


Uc = Intermediate circuit DC voltage
P = Converter supply power</td><td>R</td><td>1000 ms</td></tr>
<tr><td></td><td>2…999900 ms</td><td>Time delay</td><td>1 = 1 ms</td><td></td></tr>
<tr><td>21.04</td><td>STOP LEVEL POWER</td><td>Defines the motoring (forward) power for the modulator stop function. See parameter 21.03 STOP LEVEL TIME.</td><td>R</td><td>0 kW</td></tr>
<tr><td></td><td>0...04.06 kW</td><td>Motoring (forward) power</td><td>1 = 1 kW</td><td></td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>T./FbEq</th><th>Def.</th></tr>
<tr><td colspan="2">23 DC VOLT REF</td><td>Intermediate circuit DC voltage reference. See sections DC voltage control on page 23 and Block diagram: reference select on page 65.</td><td></td><td></td></tr>
<tr><td>23.01</td><td>DC VOLT REF</td><td>Defines the intermediate circuit DC voltage reference. By changing this parameter value from the default value, the DC link voltage can be raised higher than with a conventional 6-pulse diode rectifier in order to compensate a low voltage level in the network.
Example: If the supply voltage is 380 V, and the motor voltage 400 V, the voltage difference can be compensated simply by setting the DC voltage reference to 565 V (i.e. sqrt(2) · 400 V). However, the line-side converter power is still calculated on the basis of 380 V:
P = sqrt(3) · 380 · line current.

WARNING! If intermediate circuit voltage is increased, also the motor supply voltage at nominal frequency increases. Check that the motor insulation tolerates the change.
WARNING! Beware of the supply unit LCL filter overheating. The heat loss increases as the intermediate circuit level increases. Before changing the voltage reference, consult your local ABB representative.</td><td>R</td><td>220…
1073 V</td></tr>
<tr><td></td><td>V</td><td>DC voltage reference. The setting range varies depending on the value of signal 04.04 CONV NOM VOLTAGE as follows:
<table><tr><th>Par. 04.04 [V]</th><th colspan="2">DC reference range 1)</th></tr><tr><th></th><th>Minimum [V]</th><th>Maximum [V]</th></tr><tr><td>240</td><td>220</td><td>373</td></tr><tr><td>415</td><td>380</td><td>646</td></tr><tr><td>500</td><td>457</td><td>778</td></tr><tr><td>690</td><td>632</td><td>1073</td></tr></table>1) (approximately 65%...110%) · sqrt(2) · par. 4.04 CONV NOM VOLTAGE
Note: The program limits the minimum value to sqrt(2) · U_{AC}.</td><td>1 = 1 V</td><td></td></tr>
<tr><td colspan="2">24 REACTIVE POWER</td><td>Reactive power compensation. See sections Reactive power control on page 24 and Block diagram: reference select on page 65.</td><td></td><td></td></tr>
<tr><td>24.01</td><td>Q POWER REF</td><td>Defines the reference value for the reactive power generation. Line-side converter can generate reactive power to the supply network. See also parameter 24.02 Q POWER REF2.</td><td>R</td><td>0%</td></tr>
<tr><td></td><td>-100...+100%</td><td>Reactive power in percent of the converter nominal power (signal 04.06 CONV NOM POWER).
Positive value denotes capacitive load.
Negative value denotes inductive load.</td><td>100 = 1%</td><td></td></tr>
</table>

No.	Name/Value	Description	T./FbEq	Def.
24.02	Q POWER REF2	Defines the reference for the reactive power generation written into parameter 24.01 Q POWER REF. The reference unit is selected by parameter 24.03 Q POWER REF2 SEL. **Note:** Parameter 11.02 Q REF SELECT must be set to PARAM 24.02.	I	0
	-32768....32767 (equals to -327.68...327.67%)	Reference value Example: When parameter 24.03 Q POWER REF2 SEL is set to PERCENT, value 10000 of parameter 24.02 Q POWER REF2 equals to value 100% of parameter 24.01 Q POWER REF (i.e. 100% of the converter nominal power given in signal 04.06 CONV NOM POWER).	1 = 1	
	-32768....32767 (equals to -32768...32767 kVAr)	Reference value Example: When parameter 24.03 Q POWER REF2 SEL is set to kVAr, value 1000 of parameter 24.02 Q POWER REF2 equals to parameter 24.01 Q POWER REF value calculated with the following equation: 100 · (1000 kVAr divided by converter nominal power in kVAr)%.	1 = 1	
	-3000...3000 (equals to -30...30 deg)	Reference value Example: When parameter 24.03 Q POWER REF2 SEL is set to PHI, value 3000 of parameter 24.02 POWER REF2 equals approximately to parameter 24.01 Q POWER REF value calculated with the following equation (where P is read from actual signal 01.09 POWER): $\cos(\varphi) = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q^2}}$  Positive reference denotes capacitive load. Negative reference denotes inductive load. Parameter 24.02 values are converted to degrees by the application program: -3000...3000 ≙ -30°...30°. Values above 3000 or below -3000 equal to -30°/30°, since the range is limited to -3000/3000.	1 = 1	
	-8600...-9999 (equals to -0.86...-0.9999) and 8600...10000 (equals to 0.86...1.0000)	Reference value when parameter 24.03 Q POWER REF2 SEL is set to COSPHI. Positive reference denotes capacitive load. Negative reference denotes inductive load.	1 = 1	
24.03	Q POWER REF2 SEL	Selects the reference unit. See parameter 24.02 Q POWER REF 2.	I	PERCENT
	PERCENT	In percent of the nominal power	1	
	kVAr	kVAr	2	
	PHI	angle φ	3	
	COSPHI	Cosφ	4	
24.04	Q POWER REF ADD	Adds a defined value to 24.02 Q POWER REF2.	R	0 kVAr
	-30000...30000 kVAr		1 = 1 kVAr	

No.	Name/Value	Description	T./FbEq	Def.
30 FAULT FUNCTIONS		Programmable protection functions		
30.02	EARTH FAULT	Selects how the drive reacts when an earth (ground) fault or current unbalance is detected. **Note:** With parallel connected units 30.02 EARTH FAULT is forced to value FAULT and the fault message is CUR UNBAL xx instead of EARTH FAULT. **Note:** ACS800-11/U11 line-side converter is not equipped with earth fault supervision.	B	FAULT
	WARNING	The converter generates warning EARTH FAULT.	0	
	FAULT	The converter trips on fault EARTH FAULT / CUR UNBAL xx.	1	
30.03	EARTH FAULT LEVEL	Selects the earth (ground) fault level. • Non-parallel connected converters: Defines the earth (ground) fault level. • Parallel connected converters: Defines the converter input current imbalance level (e.g. a short-circuit). **Note:** This parameter cannot be changed without a valid pass code. Contact your local ABB representative.	R	3 for ACS800 4 for ACS600 non-parallel connected 5 for parallel connected
	1	1% unbalance in the sum current	1 = 1	
	2	3% unbalance in the sum current		
	3	8% unbalance in the sum current		
	4	13% unbalance in the sum current		
	5	18% unbalance in the sum current		
	6	28% unbalance in the sum current		
	7	39% unbalance in the sum current		
	8	62% unbalance in the sum current		
30.04	EXT EARTH FAULT	Selects how the converter reacts when an external earth (ground) fault indication is detected with a detector connected to digital input DI4.	I	NO
	NO	Not in use	1	
	DI4 = 0 FAULTS	Converter trips on E EARTH FLT if digital input DI4 is OFF (0).	2	
	DI4 = 1 FAULTS	Converter trips on E EARTH FLT if digital input DI4 is ON (1).	3	
	DI4 = 0 ALARMS	Converter generates warning E EARTH FLT if digital input DI4 is OFF (0).	4	
	DI4 = 1 ALARMS	Converter generates warning E EARTH FLT if digital input DI4 is ON (1).	5	
30.05	EXT EVENT	Selects how the converter reacts to the state of digital input DI5.	I	NO
	NO	Not in use	1	
	DI5 = 0 FAULTS	If digital input DI5 is OFF (0), the converter first generates warning EXT EVENT DI5 and trips on fault EXT EVENT DI5 after the delay defined by parameter 30.10 DI5 TRIP DELAY has elapsed.	2	
	DI5 = 1 FAULTS	If digital input DI5 is ON (1), the converter first generates warning EXT EVENT DI5 and trips on fault EXT EVENT DI5 after the delay defined by parameter 30.10 DI5 TRIP DELAY has elapsed.	3	
	DI5 = 0 ALARMS	If digital input DI5 is OFF (0), converter generates warning EXT EVENT DI5.	4	

No.	Name/Value	Description	T./FbEq	Def.
	DI5 = 1 ALARMS	If digital input DI5 is ON (1), converter generates warning EXT EVENT DI5.	5	
30.10	DI5 TRIP DELAY	Defines the delay time before the converter trips on fault EXT EVENT DI5. Supervision is selected by parameter 30.05 EXT EVENT.	R	0 s
	0…3600 s	Delay time	1 = 1	
30.11	DC OVERVOLT TRIP	Defines the intermediate circuit DC overvoltage fault DC OVERVOLT trip limit. Default trip limit is 427 VDC for 240 V units, 740 VDC for 415 V units, 891 VDC for 500 V units and 1230 VDC for 690 V units.	R	427/740/ 891/1230 V
	30.12...99% of 04.07 V	Trip limit	1 = 1 V	
30.12	DC UNDERVOLT TRIP	Defines the intermediate circuit DC undervoltage fault DC UNDERVOLT trip limit. Default trip limit is 170 VDC for 240 V units, 293 VDC for 415 V units, 354 VDC for 500 V units and 488 VDC for 690 V units. **Note:** This parameter also determines the DC voltage check limit during charging. See also section *Missing phase* on page *21*.	R	170/293/ 354/488 V
	0...30.11 V	Trip limit	1 = 1 V	
31 AUTOMATIC RESET		Automatic fault reset Automatic resets are possible only for certain fault types and when the automatic reset function is activated for that fault type. The automatic reset function is not operational if the drive is in local control (L visible on the first row of the control panel display). **WARNING!** If the start command is selected and it is ON, the converter may restart immediately after automatic fault reset. Ensure that the use of this feature will not cause danger. **WARNING!** Do not use these parameters when the drive is connected to a common DC bus. The charging resistors may be damaged in an automatic reset.		
31.01	NUMBER OF TRIALS	Defines the number of automatic fault resets the drive performs within the time defined by parameter 31.02 TRIAL TIME.	I	0
	0...5	Number of the automatic resets	0	
31.02	TRIAL TIME	Defines the time for the automatic fault reset function. See parameter 31.01 NUMBER OF TRIALS.	R	30 s
	1.0...180.0 s	Allowed resetting time	100... 18000	
31.03	DELAY TIME	Defines the time the drive will wait after a fault before attempting an automatic reset. See parameter 31.01 NUMBER OF TRIALS.	R	0 s
	0.0...3.0 s	Reset delay	0...300	
31.04	OVERCURRENT	Activates/deactivates the automatic reset for the converter overcurrent fault.	B	NO
	NO	Inactive	0	
	YES	Active	65535	
31.05	OVERVOLTAGE	Activates/deactivates the automatic reset for the intermediate link overvoltage fault.	B	NO
	NO	Inactive	0	
	YES	Active	65535	

No.	Name/Value	Description	T./FbEq	Def.
31.06	UNDERVOLTAGE	Activates/deactivates the automatic reset for the intermediate link undervoltage fault.	B	NO
	NO	Inactive	0	
	YES	Active	65535	
51 MASTER ADAPTER		These parameters are visible and need to be adjusted, only when a fieldbus adapter module (optional) is installed and activated by parameter 98.02 COMM. MODULE. For details on the parameters, refer to the manual of the fieldbus module and chapter *Fieldbus control*. **Note:** Any changes in these parameters take effect only after the next power-up of the adapter module.		
51.01	FIELDBUS PAR1	(Module type and software version)		
51.02 ... 51.33	FIELDBUS PAR2...33	(According to module type)		
52 STANDARD MODBUS		Settings for the Standard Modbus Link. See chapter *Fieldbus control*. These settings are only visible when parameter 98.02 COMM. MODULE has been set to STANDARD MODBUS. See the *RMBA-01 Modbus Adapter User's Manual* [3AFE64498851 (English)].		
52.01	STATION NUMBER	Defines the address of the device. Two units with the same address are not allowed on-line.	I	1
	1...247	Address		
52.02	BAUDRATE	Defines the transfer rate of the link.	I	5
	1	600 bit/s		
	2	1200 bit/s		
	3	2400 bit/s		
	4	4800 bit/s		
	5	9600 bit/s		
	6	19200 bit/s		
52.03	PARITY	Defines the use of parity and stop bit(s). The same setting must be used in all on-line stations.	I	3
	1 = NONE1STOPBIT	No parity bit, one stop bit		
	2 = NONE2STOPBIT	No parity bit, two stop bits		
	3 = ODD	Odd parity indication bit, one stop bit		
	4 = EVEN	Even parity indication bit, one stop bit		
70 DDCS CONTROL		Settings for the fibre optic channels CH0, CH1 and CH3		
70.01	CH0 NODE ADDR	Defines the node address for DDCS channel CH0. No two nodes on-line may have the same address. With AC 800M (CI858) DriveBus connection the drives are addressed from 1 to 24. With AC 80 DriveBus connection, the drives are addressed from 1 to 12. In other control systems, the node address is set according to the application. **Note:** Value is automatically set to 120 if parameter 98.02 COMM. MODULE is set to INVERTER.	R	1
	1...254	Node address	1 = 1	

No.	Name/Value	Description	T./FbEq	Def.
70.02	CH0 LINK CONTROL	Defines the light intensity of the transmission LEDs. LEDs act as light sources for option fibres which are connected to DDCS channel CH0. With the maximum length of optic fibre cable, use value 15.	R	10
	1...15	Light intensity	1 = 1	
70.03	CH0 BAUD RATE	Selects the communication speed of DDCS channel CH0. If FCI (Fieldbus Communication Interface) and fieldbus communication modules are used, parameter has to be set to 4 Mbit/s. Otherwise, the external control system sets the communication speed automatically.	I	4 Mbit/s
	8 Mbit/s	8 Mbit/s (not in use)	0	
	4 Mbit/s	4 Mbit/s	1	
	2 Mbit/s	2 Mbit/s (not in use)	2	
	1 Mbit/s	1 Mbit/s	3	
70.04	CH0 TIMEOUT	Defines the time delay before channel CH0 or type Rxxx fieldbus adapter interface communication break alarm/fault (COMM MODULE) is activated. Time count starts when the link fails to update the communication message. The action taken by the drive on a communication break is defined by parameter 70.05 CH0 COM LOSS CTRL. When parameter is set to zero, time is not monitored and CH0 COMM MODULE fault is not indicated regardless of the value of parameter 70.05 CH0 COM LOSS CTRL.	R	100 ms
	0...60000 ms	Time	1 = 1 ms	
70.05	CH0 COM LOSS CTR	Selects how the drive reacts when communication error on DDCS channel CH0 or on type Rxxx fieldbus adapter interface has been detected. Time delay for the communication break alarm/fault activation is defined by parameter 70.04 CH0 TIMEOUT. **Note**: This parameter is in use when parameter 98.01 COMMAND SEL is set to MCW and external serial communication is activated by parameter 98.02 COMM. MODULE.	I	FAULT
	NO FAULT	Converter generates warning COMM MODULE.	1	
	FAULT	Converter trips on fault COMM MODULE.	2	
70.06	CH1 LINK CONTROL	Defines the light intensity of the transmission LEDs. LEDs act as light sources for option fibres which are connected to DDCS channel CH1. With the maximum length of optic fibre cable, use value 15.	R	10
	1...15	Light intensity	1 = 1	
70.15	CH3 NODE ADDR	Defines the node address for DDCS channel CH3. No two nodes on-line may have the same address. Typically the setting needs to be changed when the drive is connected in a ring configuration which consists of several converters and a PC with a DriveWindow PC tool. **Note:** The new node address becomes valid only after the next power-up of the RMIO board.	R	1
	1...254	Node address	1 = 1	
70.16	CH3 LINK CONTROL	Defines the light intensity of the transmission LEDs. LEDs act as light sources for option fibres which are connected to DDCS channel CH3. With the maximum length of optic fibre cable, use value 15.	R	15
	1...15	Light intensity	1 = 1	

No.	Name/Value	Description	T./FbEq	Def.
70.19	CH0 HW CONNECTION	Selects the topology of the DDCS channel CH0 link. **Note:** This parameter is not in use in DriveBus mode. **Note:** Value is automatically set to RING if parameter 98.02 COMM. MODULE is set to INVERTER.	B	STAR
	RING	Devices are connected in a ring.	0	
	STAR	Devices are connected in a star.	1	
70.20	CH3 HW CONNECTION	Selects the topology of the DDCS channel CH3 link. ***Note:** With ACS800-11/U11/17 the default value of this parameter is RING.	B	STAR*
	RING	Devices are connected in a ring.	0	
	STAR	Devices are connected in a star.	1	
71 DRIVEBUS COM		DDCS channel CH0 DriveBus settings		
71.01	CH0 DRIVEBUS MODE	Selects the communication mode for the DDCS channel CH0. The new mode becomes valid only after the next power-up of the converter. Data is exchanged 4 times faster in DriveBus mode than in DDCS mode. **Note:** Value is automatically set to NO if parameter 98.02 COMM. MODULE is set to INVERTER.	B	YES
	NO	DDCS mode	0	
	YES	DriveBus mode	1	
90 DATA SET RECEIVE ADDRESSES		Addresses into which the received fieldbus datasets are written. The parameters are visible only when parameter 98.02 COMM. MODULE is set to ADVANT/N-FB. For more information, see chapter *Fieldbus control*.		
90.01	D SET 10 VAL 1	Selects the address into which dataword 1 of dataset 10 is written. Update time is 2 ms.	I	701
	0…20000	Parameter index		
90.02	D SET 10 VAL 2	Selects the address into which dataword 2 of dataset 10 is written. Update time is 2 ms.	I	0
	0…20000	Parameter index		
90.03	D SET 10 VAL 3	Selects the address into which dataword 3 of dataset 10 is written. Update time is 2 ms.	I	0
	0…20000	Parameter index		
90.04	D SET 12 VAL 1	Selects the address into which dataword 1 of dataset 12 is written. Update time is 4 ms.	I	0
	0…20000	Parameter index		
90.05	D SET 12 VAL 2	Selects the address into which dataword 2 of dataset 12 is written. Update time is 4 ms.	I	0
	0…20000	Parameter index		
90.06	D SET 12 VAL 3	Selects the address into which dataword 3 of dataset 12 is written. Update time is 4 ms.	I	0
	0…20000	Parameter index		
90.07	D SET 14 VAL 1	Selects the address into which dataword 1 of dataset 14 is written. Update time is 10 ms.	I	0
	0…9999	Parameter index		

No.	Name/Value	Description	T./FbEq	Def.
90.08	D SET 14 VAL 2	Selects the address into which dataword 2 of dataset 14 is written. Update time is 10 ms.	I	0
	0…9999	Parameter index		
90.09	D SET 14 VAL 3	Selects the address into which dataword 3 of dataset 14 is written. Update time is 10 ms.	I	0
	0…9999	Parameter index		
90.10	D SET 16 VAL 1	Selects the address into which dataword 1 of dataset 16 is written. Update time is 10 ms.	I	0
	0…9999	Parameter index		
90.11	D SET 16 VAL 2	Selects the address into which dataword 2 of dataset 16 is written. Update time is 10 ms.	I	0
	0…9999	Parameter index		
90.12	D SET 16 VAL 3	Selects the address into which dataword 3 of dataset 16 is written. Update time is 10 ms.	I	0
	0…9999	Parameter index		
90.13	D SET 18 VAL 1	Selects the address into which dataword 1 of dataset 18 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		
90.14	D SET 18 VAL 2	Selects the address into which dataword 2 of dataset 18 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		
90.15	D SET 18 VAL 3	Selects the address into which dataword 3 of dataset 18 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		
90.16	D SET 20 VAL 1	Selects the address into which dataword 1 of dataset 20 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		
90.17	D SET 20 VAL 2	Selects the address into which dataword 2 of dataset 20 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		
90.18	D SET 20 VAL 3	Selects the address into which dataword 3 of dataset 20 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		
91 DATA SET RECEIVE ADDRESSES		See 90 DATA SET RECEIVE ADDRESSES.		
91.01	D SET 22 VAL 1	Selects the address into which dataword 1 of dataset 22 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		
…	…	…	…	…
91.06	D SET 24 VAL 3	Selects the address into which dataword 3 of dataset 24 is written. Update time is 100 ms.	I	0
	0…9999	Parameter index		

No.	Name/Value	Description	T./FbEq	Def.
92 DATA SET TRANSMIT ADDRESSES		Datasets which the converter sends to the fieldbus master station. The parameters are visible only parameter 98.02 COMM. MODULE is set to ADVANT/N-FB. For more information, see chapter *Fieldbus control*.		
92.01	D SET 11 VAL 1	Selects the address from which dataword 1 of dataset 11 is read. Update time is 2 ms.	I	801
	0…20000	Parameter index		
92.02	D SET 11 VAL 2	Selects the address from which dataword 2 of dataset 11 is read. Update time is 2 ms.	I	110
	0…20000	Parameter index		
92.03	D SET 11 VAL 3	Selects the address from which dataword 3 of dataset 11 is read. Update time is 2 ms.	I	0
	0…20000	Parameter index		
92.04	D SET 13 VAL 1	Selects the address from which dataword 1 of dataset 13 is read. Update time is 4 ms.	I	0
	0…20000	Parameter index		
92.05	D SET 13 VAL 2	Selects the address from which dataword 2 of dataset 13 is read. Update time is 4 ms.	I	111
	0…20000	Parameter index		
92.06	D SET 13 VAL 3	Selects the address from which dataword 3 of dataset 13 is read. Update time is 4 ms.	I	106
	0…20000	Parameter index		
92.07	D SET 15 VAL 1	Selects the address from which dataword 1 of dataset 15 is read. Update time is 10 ms.	I	911
	0…9999	Parameter index		
92.08	D SET 15 VAL 2	Selects the address from which dataword 2 of dataset 15 is read. Update time is 10 ms.	I	0
	0…9999	Parameter index		
92.09	D SET 15 VAL 3	Selects the address from which dataword 3 of dataset 15 is read. Update time is 10 ms.	I	0
	0…9999	Parameter index		
92.10	D SET 17 VAL 1	Selects the address from which dataword 1 of dataset 17 is read. Update time is 10 ms.	I	912
	0…9999	Parameter index		
92.11	D SET 17 VAL 2	Selects the address from which dataword 2 of dataset 17 is read. Update time is 10 ms.	I	115
	0…9999	Parameter index		
92.12	D SET 17 VAL 3	Selects the address from which dataword 3 of dataset 17 is read. Update time is 10 ms.	I	122
	0…9999	Parameter index		
92.13	D SET 19 VAL 1	Selects the address from which dataword 1 of dataset 19 is read. Update time is 100 ms.	I	0
	0…9999	Parameter index		
92.14	D SET 19 VAL 2	Selects the address from which dataword 2 of dataset 19 is read. Update time is 100 ms.	I	0
	0…9999	Parameter index		

No.	Name/Value	Description	T./FbEq	Def.
92.15	D SET 19 VAL 3	Selects the address from which dataword 3 of dataset 19 is read. Update time is 100 ms.	I	0
	0…9999	Parameter index		
92.16	D SET 21 VAL 1	Selects the address from which dataword 1 of dataset 21 is read. Update time is 100 ms.	I	108
	0…9999	Parameter index		
92.17	D SET 21 VAL 2	Selects the address from which dataword 2 of dataset 21 is read. Update time is 100 ms.	I	112
	0…9999	Parameter index		
92.18	D SET 21 VAL 3	Selects the address from which dataword 3 of dataset 21 is read. Update time is 100 ms.	I	0
	0…9999	Parameter index		
93 DATA SET TRANSMIT ADDRESSES		See 92 DATA SET TRANSMIT ADDRESSES.		
93.01	D SET 23 VAL 1	Selects the address from which dataword 1 of dataset 23 is read. Update time is 100 ms.	I	0
	0…9999	Parameter index		
…	…	…	…	…
93.06	D SET 25 VAL 3	Selects the address from which dataword 3 of dataset 25 is read. Update time is 100 ms.	I	0
	0…9999	Parameter index		
98 OPTION MODULES		Activation of external serial communication. See chapter *Fieldbus control*. See also section *Start via fieldbus* on page *19*.		
98.01	COMMAND SEL	Selects the control command interface(s). ***Note:** With ACS800-11/U11/17 the default value of this parameter is MCW. If parameter 16.15 I/O START MODE is set to DI2 LEVEL and parameter 98.02 COMM. MODULE is set to INVERTER, the default value is forced to I/O.	B	I/O*
	MCW	Via a serial link and through digital input terminals	0	
	I/O	Through digital input terminals	1	
98.02	COMM. MODULE	Activates the external serial communication and selects the interface. ***Note:** With ACS800-11/U11/17 the default value of this parameter is INVERTER.	I	NO*
	NO	No external serial communication. The converter is controlled through the I/O interface. See parameters 16.01 RUN BIT SEL and 16.15 I/O START MODE.	1	
	FIELDBUS	The converter communicates through an Rxxx type fieldbus adapter connected to Slot 1 or through an Nxxx type fieldbus adapter connected to RMIO board DDCS channel CH0 using data sets 1 and 2. Data set 1 and 2 are typically used with type Rxxx or Nxxx fieldbus adapter modules. See also parameter group 51 MASTER ADAPTER (fieldbus adapter).	2	

No.	Name/Value	Description	T./FbEq	Def.
	ADVANT/N-FB	The converter communicates via RMIO board DDCS channel CH0 using datasets 10 to 25. This selection is used with e.g. AC 800M, AC 80, APC2 and Nxxx type fieldbus adapters. See also parameter groups 70 DDCS CONTROL and 71 DRIVEBUS COM.	3	
	STD MODBUS	The converter communicates through RMBA-0x Modbus adapter module connected to option Slot 1 of the drive. **Note:** With NMBA, use selection FIELDBUS or ADVANT/N-FB. See parameter group 52 STANDARD MODBUS and *RMBA-01 Modbus Adapter User's Manual* [3AFE64498851 (English)].	4	
	NOT USED	-	5	
	NOT USED	-	6	
	NOT USED	-	7	
	INVERTER	Converter is controlled by another inverter.	8	
99 START UP DATA		Language, identification run selection etc.		
99.01	LANGUAGE	Selects the display language.	I	ENGLISH
	ENGLISH	English	0	
	DEUTSCH	German	2	
99.02	DEVICE NAME	Defines the name for the drive or application. The name is visible on the control panel display in the Drive Selection Mode or on the DriveWindow main menu. **Note:** The name can be typed only by using a drive PC tool.	C	
		Name		
99.06	FAST SYNC	Activates the fast synchronisation of the line-side converter at start. See section *Synchronisation* on page *15*.	B	YES
	NO	Inactive: synchronisation with phase order check	0	
	YES	Active: synchronisation without phase order check	1	
99.07	LINE SIDE ID RUN	Enables the manual Line-side Identification. See section *Identification routine* on page *14*.	B	NO
	NO	Disabled	0	
	YES	Enabled. The identification starts when the line-side converter receives the start command. (Identification takes about 4 seconds. It is not allowed to load the line-side converter during the identification.)	1	
99.08	AUTO LINE ID RUN	Enables the automatic Line-side Identification. See section *Identification routine* on page *14*.	B	YES
	NO	Disabled **Note:** Automatic identification can be disabled, if the identification routine has been preformed during the first start-up and the phase order has not been changed after the first start-up.	0	
	YES	Enabled. The identification is requested automatically after the RMIO board power-up. The identification starts automatically when the line-side converter receives the start command. The parameter actually forces parameter 99.07 LINE SIDE ID RUN to YES. (Identification takes about 4 seconds. It is not allowed to load the line-side converter during the identification.)	1	
99.09	APPLIC RESTORE	Restores the original parameter settings.	B	NO
	NO	No	0	
	YES	Yes	1	

No.	Name/Value	Description	T./FbEq	Def.
99.10	SUPPLY ID NUMBER	This parameter can be used by an external control system to check the right connections of the optical cables to the converter. This parameter requires support from the external control system to verify the correct connection.	I	0
	0...32767			

Fieldbus control

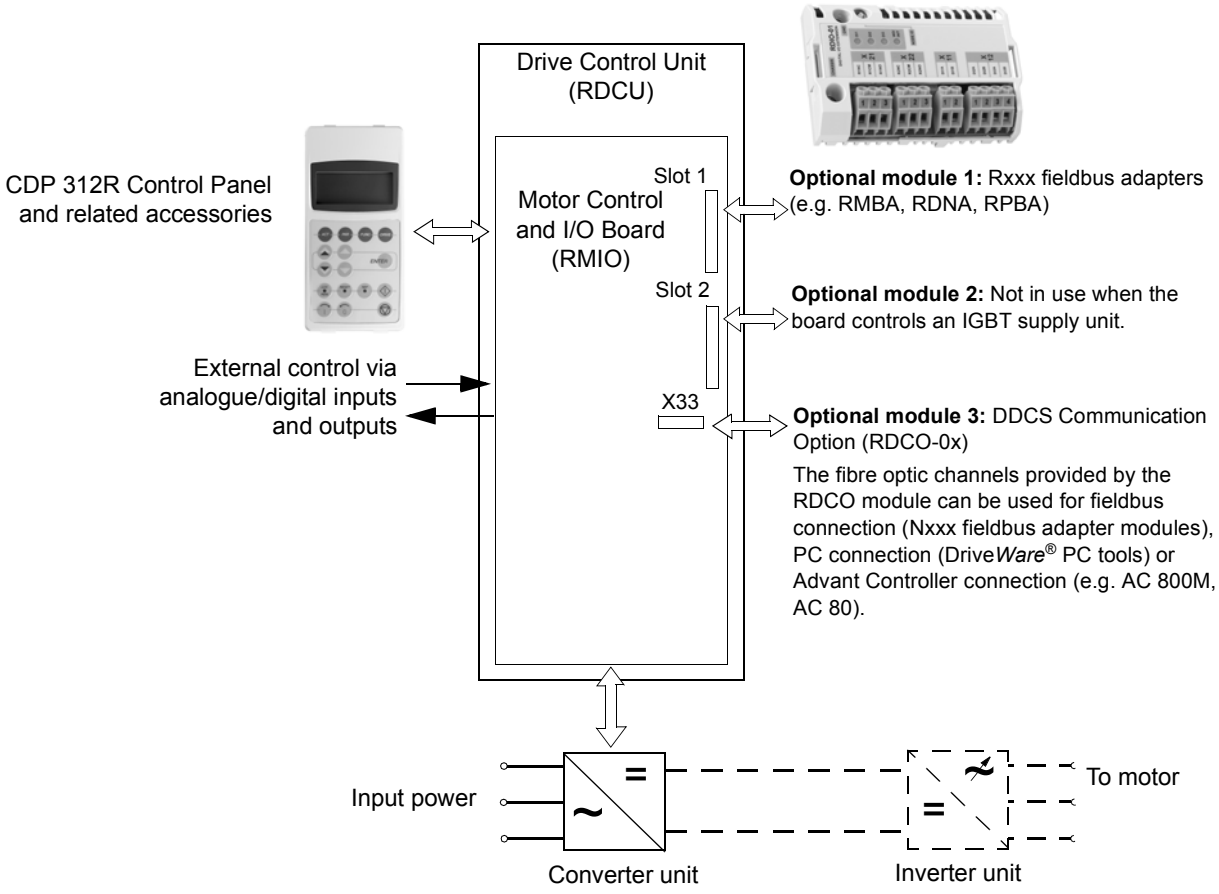
What this chapter contains

This chapter describes how the drive can be controlled by external devices over a communication network.

System overview

The drive can be connected to an external control system – usually a fieldbus controller – via an adapter module. The drive can be set to receive all of its control information through the external control interface, or the control can be distributed between the external control interface and other available sources, for example digital and analogue inputs.

The following diagram shows the control interfaces and I/O options of the supply unit.



The line-side converter can also be controlled by another inverter.

The following table gives information on the DDCS (Distributed Drives Communication System) channels CH0...CH3 of the RDCO module.

Channel	Interfaces	RDCO-01*	RDCO-02*
CH0	Advant Controller Fieldbus Interface	10 MBd DDCS/DriveBus	5 MBd
CH1	Basic I/O / Optional I/O	5 MBd	5 MBd
CH2	Master/Follower	10 MBd	10 MBd
CH3	DriveWindow (PC, 1 Mbit/s)	10 MBd	10 MBd

*RDCO-01/02 is connected to the RMIO board.

Setting up communication through fieldbus

Fieldbus adapters for several communication protocols are available (e.g. PROFIBUS and Modbus). Rxxx type fieldbus adapter modules are mounted in expansion Slot 1 of the drive. Nxxx type fieldbus adapter modules are connected to channel CH0 of the RDCO module.

Note: For instructions on setting up an RMBA-01 module, see section *Setting up communication through the Standard Modbus Link* on page *58*.

Before configuring the drive for fieldbus control, the adapter module must be mechanically and electrically installed according to the instructions given in the hardware manual of the drive, and the module manual.

The following table lists the parameters, which need to be defined when setting up communication through a fieldbus adapter.

Parameter	Alternative settings	Setting for fieldbus control	Function/Information
98.01 COMMAND SEL	MCW I/O	MCW	Selects the control command interface(s).
98.02 COMM. MODULE	NO FIELDBUS ADVANT/N-FB STD MODBUS	FIELDBUS (with Rxxx or Nxxx) ADVANT/N-FB (with Nxxx)	Initialises communication between drive and fieldbus adapter module. Activates module set-up parameters for type Nxxx and Rxxx fieldbus modules (group 51 MASTER ADAPTER).
70.01 CH0 NODE ADDR	1-125	1	Defines the node address for DDCS channel CH0 (type Nxxx adapter).
71.01 CH0 DRIVEBUS MODE *	YES = DriveBus mode NO = DDCS mode	NO	Selects communication mode for DDCS channel CH0 (type Nxxx adapter).
70.04 CH0 TIMEOUT	0-60000 ms		Defines the delay time before channel CH0 (type Nxxx adapter) or type Rxxx fieldbus adapter interface communication break alarm/fault is indicated.
70.05 CH0 COM LOSS CTRL	NO FAULT FAULT		Defines the action taken after CH0 (type Nxxx adapter) or type Rxxx fieldbus adapter interface communication fault.
70.19 CH0 HW CONNECTION	RING STAR	Default value is STAR which is typically used with branching units. This parameter has no effect in DriveBus mode.	Selects the topology of the DDCS channel CH0 (type Nxxx adapter) link.
Groups 90 DATA SET RECEIVE ADDRESSES... 93 DATA SET TRANSMIT ADDRESSES			Addresses for receive and transmit data. **Note**: When 98.02 COMM.MODULE is set to FIELDBUS, the addresses for receive and transmit data are fixed. See section *Fieldbus control interface* on page *62*.

* Parameter is valid after the next power-up of the drive.

Setting up communication through the Standard Modbus Link

An RMBA-01 Modbus Adapter connected to Slot 1 of the RMIO board forms an interface called the Standard Modbus Link. The Standard Modbus Link can be used for external control of the drive by a Modbus controller (RTU protocol only).

Before configuring the drive for Modbus control, the adapter module must be mechanically and electrically installed according to the instructions given in the hardware manual of the drive, and the module manual.

The following table lists the parameters, which need to be defined when setting up communication through the Standard Modbus link.

Note: With NMBA-01 Modbus Adapter, parameter 98.02 COMM. MODULE must be set to FIELDBUS or ADVANT/N-FB. See section *Setting up communication through fieldbus* on page *57*.

Parameter	Alternative settings	Setting for fieldbus control	Function/Information
98.01 COMMAND SEL	MCW I/O	MCW	Selects the control command interface(s).
98.02 COMM. MODULE	NO FIELDBUS ADVANT/N-FB STD MODBUS	STD MODBUS	Initialises communication between drive (Standard Modbus Link) and Modbus protocol controller. Activates communication parameters in group 52 STANDARD MODBUS.

When 98.02 COMM.MODULE is set to STD MODBUS, the addresses for receive and transmit data are fixed. See section *Fieldbus control interface* on page *62*.

More information on Modbus communication is available from the Modicon website http://www.modicon.com.

Setting up communication through Advant Controller

The Advant Controller is connected via DDCS link to channel CH0 of the RDCO module.

- **AC 800M Advant Controller**

DriveBus connection: CI858 DriveBus Communication Interface required. See *CI858 DriveBus Communication Interface User's Manual* [3AFE68237432 (English)].

Optical ModuleBus connection: TB811 (5 MBd) or TB810 (10 MBd) Optical ModuleBus Port Interface required. See section *Optical ModuleBus connection* below.

For more information, see *AC 800M Controller Hardware Manual* [3BSE027941 (English)], *AC 800M/C Communication, Protocols and Design manual* [3BSE028811 (English)] ABB Industrial Systems, Västerås, Sweden.

- **AC 80 Advant Controller**

DriveBus connection: Connectable to RMIO-01/02 board with RDCO-01.

Optical ModuleBus connection: TB811 (5 MBd) or TB810 (10 MBd) Optical ModuleBus Port Interface required. See section *Optical ModuleBus connection* below.

- **CI810A Fieldbus Communication Interface (FCI)**

Optical ModuleBus connection

TB811 (5 MBd) or TB810 (10 MBd) Optical ModuleBus Port Interface required.

The TB811 Optical ModuleBus Port Interface is equipped with 5 MBd optical components, while the TB810 is equipped with 10 MBd components. All optical components on a fibre optic link must be of the same type since 5 MBd components do not match with 10 MBd components. The choice between TB810 and TB811 depends on the equipment it is connected to. With RDCO Communication Option Module, the Interface is selected as follows:

Optional ModuleBus Port Interface	DDCS Communication Option Module		
	RDCO-01	RDCO-02	RDCO-03
TB811		×	×
TB810	×		

If branching unit NDBU-85/95 is used with CI810A, TB810 Optical ModuleBus Port Interface must be used.

The following table lists the parameters, which need to be defined when setting up communication between the drive and Advant Controller.

Parameter	Alternative settings	Setting for fieldbus control	Function/Information
98.01 COMMAND SEL	MCW I/O	MCW	Selects the control command interface(s).
98.02 COMM. MODULE	NO FIELDBUS ADVANT/N-FB STD MODBUS	ADVANT/N-FB	Initialises communication between drive (fibre optic channel CH0) and Advant Controller. The transmission speed is 4 Mbit/s.
70.01 CH0 NODE ADDR	1-125	AC 800M DriveBus (CI858) ⏏ 1...24 AC 800M ModuleBus ⏏ 1...125 AC 80 DriveBus ⏏ 1-12 AC 80 ModuleBus ⏏ 17-125 FCI (CI810A) ⏏ 17-125 APC2 ⏏ 1	Defines the node address for DDCS channel CH0.
71.01 CH0 DRIVEBUS MODE *	YES = DriveBus mode NO = DDCS mode	AC 800M DriveBus (CI858) ⏏ YES AC 800M ModuleBus ⏏ NO AC 80 DriveBus ⏏ YES APC2/AC 80 ModuleBus/FCI (CI810A) ⏏ NO	Selects the communication mode for DDCS channel CH0.
70.04 CH0 TIMEOUT	0-60000 ms		Defines the delay time before channel CH0 communication break alarm/fault is indicated.
70.05 CH0 COM LOSS CTRL	NO FAULT FAULT		Defines the action taken after CH0 communication fault.
70.19 CH0 HW CONNECTION	RING STAR	Default value is STAR which is typically used with branching units. This parameter has no effect in DriveBus mode.	Selects the topology of the DDCS channel CH0 link.
Groups 90 DATA SET RECEIVE ADDRESSES... 93 DATA SET TRANSMIT ADDRESSES			Addresses for receive and transmit data. See section *Fieldbus control interface* on page *62*.

* Parameter is valid after the next power-up of the drive.

Setting up communication through inverter module

Before configuring the drive for control, connect fibre optic cables between inverter DDCS channel CH1 and line-side converter DDCS channel CH0.

The following table lists the parameters, which need to be defined when setting up communication between inverter channel CH1 and converter channel CH0.

Converter parameter	**Alternative settings**	**Setting for inverter control**	**Function/Information**
98.01 COMMAND SEL	MCW I/O	MCW I/O	Selects the control command interface(s): MCW = Control commands through inverter. I/O = Control commands via converter digital inputs.
98.02 COMM. MODULE	NO FIELDBUS ADVANT/N-FB STD MODBUS INVERTER	INVERTER	Initialises line-side converter channel CH0 communication for inverter control.
11.01 DC REF SELECT		FIELDBUS	Defines the source for the intermediate circuit DC voltage reference. Value is automatically set to FIELDBUS if parameter 98.02 COMM. MODULE is set to INVERTER.
11.02 Q REF SELECT		PARAM 24.02	Defines the source for the reactive power reference. Value is automatically set to PARAM 24.02 if parameter 98.02 COMM. MODULE is set to INVERTER.
70.01CH0 NODE ADDR		120	Defines the node address for DDCS channel CH0. Value is automatically set to 120 if parameter 98.02 COMM. MODULE is set to INVERTER.
71.01 CH0 DRIVEBUS MODE *		NO	Selects the communication mode for the DDCS channel CH0. Value is automatically set to NO if parameter 98.02 COMM. MODULE is set to INVERTER.
70.19 CH0 HW CONNECTION		RING	Selects the topology of the DDCS channel CH0 link. Value is automatically set to RING if parameter 98.02 COMM. MODULE is set to INVERTER.
201.09 PANEL DRIVE ID *	1…65535	2…65535	Defines the panel ID number. If ID number is set to 1, it is automatically changed to 2, because number 1 is reserved for the inverter.
202.01 LOCAL LOCK	TRUE FALSE	TRUE	Disables entering local control mode (LOC/REM key of the panel), i.e. local control is not allowed, because of inverter control. Value is automatically set to TRUE if parameter 98.02 COMM.MODULE is set to INVERTER.
Inverter parameter	**Alternative settings**	**Setting for line-side converter control**	**Function/Information**
112.04 SUPPLY CTRL MODE	NONE LINE CONV	LINE CONV	Initialises inverter channel CH1 communication, i.e. enables line-side converter control.

* Parameter is valid after the next power-up of the drive.

Fieldbus control interface

The communication between an external control system and drive consists of datasets. The link sends the dataset into the dataset table in the drive program and returns the content of the next dataset to the external control system as a return message.

If DriveBus protocol is used, the DriveBus master can send one message which contains 1 dataset for 10 drives during a 1 ms time period.

One dataset (DS) consists of three 16-bit words called data words (DW). The IGBT Supply Control Program supports the use of datasets 1, 2 or datasets 10...25. The first transmitted dataset number can be assigned by setting the offset parameter in group 51 MASTER ADAPTER. For example, by setting the offset to 9, the first dataset is written to dataset 10.

Datasets 1 and 2

The contents of datasets 1 and 2 varies depending on parameter 98.02 COMM. MODULE setting.

When parameter 98.02 is set to FIELDBUS and Nxxx or RMBA-0x type of a module is used, the contents of datasets 1 and 2 is as follows:

DS	DW	Signal	Default address	Signal update time
1	1	Main Control Word	07.01 MAIN CTRL WORD	10 ms
	2	Reference 1	23.01 DC VOLT REF	10 ms
	3	Reference 2	24.02 Q POWER REF2	10 ms
2	1	Main Status Word	08.01 MAIN STATUS WORD	10 ms
	2	Actual 1	01.08 POWER	10 ms
	3	Actual 2	01.07 REACTIVE POWER	10 ms

When parameter 98.02 is set to FIELDBUS and Anybus modules are used (e.g. RPBA-0x, RDNA-0x…), the contents of datasets 1 and 2 is as follows:

DS	DW	Signal	Default address	Signal update time
1	1	Main Control Word	07.01 MAIN CTRL WORD	10 ms
	2	Reference 1	23.01 DC VOLT REF	10 ms
2	1	Main Status Word	08.01 MAIN STATUS WORD	10 ms
	2	Actual 1	01.08 POWER	10 ms

Datasets 10...25

The contents of datasets 10...25 can be selected by parameter groups 90 DATA SET RECEIVE ADDRESSES...93 DATA SET TRANSMIT ADDRESSES. Transmit and receive addresses are defined in an external control system application.

Received datasets

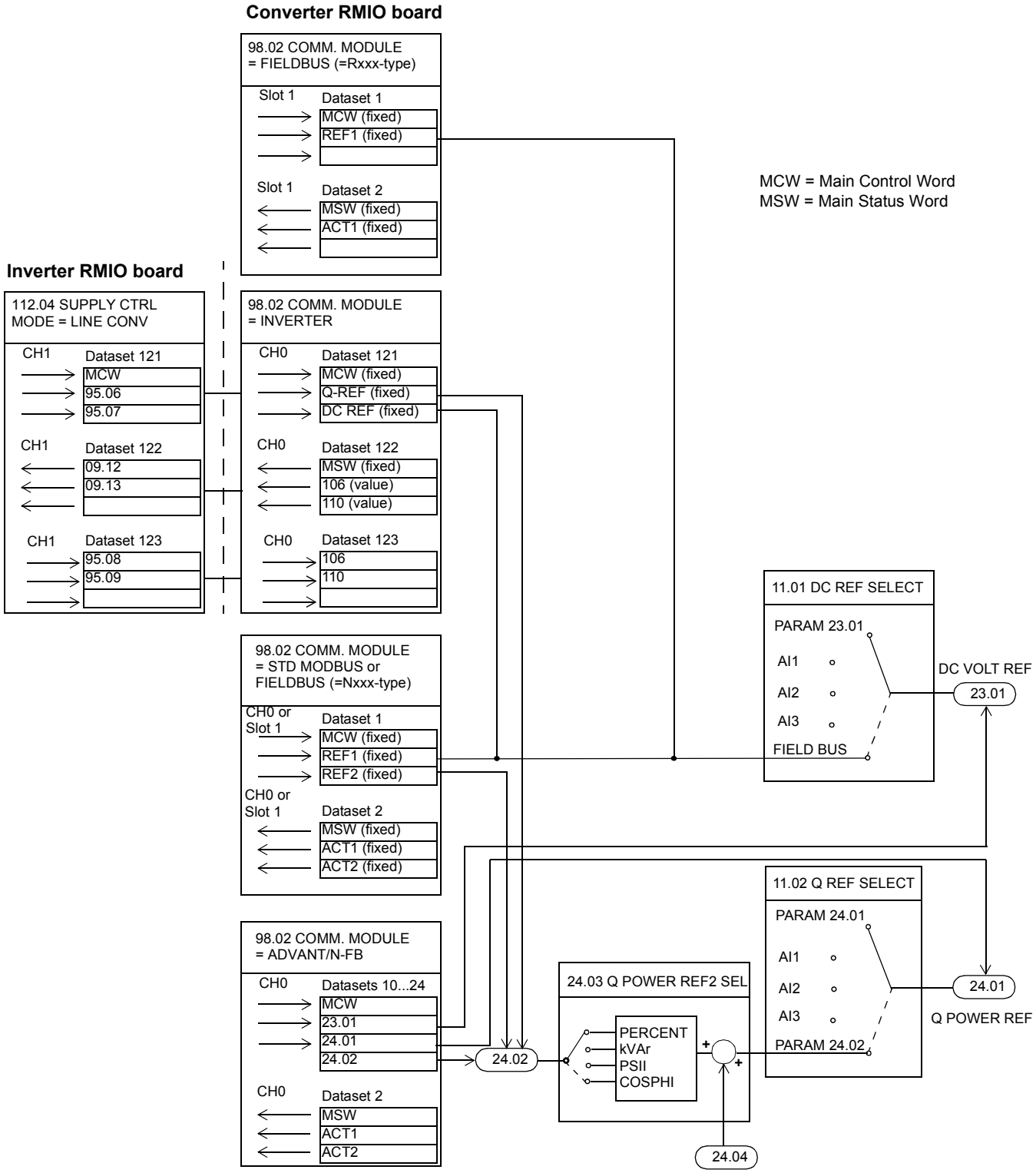
DS	DW	time*	Default address	Address
10**	1	2 ms	7.01 MAIN CTRL WORD	90.01
	2	2 ms		90.02
	3	2 ms		90.03
12**	1...3	4 ms		90.04...90.06
14	1...3	10 ms		90.07...90.09
16	1...3	10 ms		90.10...90.12
18	1...3	100 ms		90.13...90.15
20	1...3	100 ms		90.16...90.18
22	1...3	100 ms		91.01...91.03
24	1...3	100 ms		91.04...91.06
* Time within the drive reads data from the datasets to the parameter table or writes data from the parameter table to the datasets. Since the drive is a follower of the communication master, the actual communication cycle time depends on the communication speed of the master.				
** Boolean data type parameters are not supported. If boolean data type parameters need to be set from external control system, use datasets 14...24.				

Transmitted datasets

DS	DW	time*	Default address	Address
11**	1	2 ms	8.01 MAIN STATUS WORD	92.01
	2	2 ms	1.10 DC VOLTAGE	92.02
	3	2 ms		92.03
13**	1	4 ms		92.04
	2	4 ms	1.11 MAINS VOLTAGE	92.05
	3	4 ms	1.06 LINE CURRENT	92.06
15	1	10 ms	9.11 SUPPLY FAULT WORD	92.07
	2	10 ms		92.08
	3	10 ms		92.09
17	1	10 ms	9.12 SUPPLY ALARM WORD	92.10
	2	10 ms	1.15 DI6-1 STATUS	92.11
	3	10 ms	1.22 RO3-1 STATUS	92.12
19	1...3	100 ms		92.13...92.15
21	1	100 ms	1.08 POWER	92.16
	2	100 ms	1.12 ACS800 TEMP	92.17
	3	100 ms		92.18
23	1...3	100 ms		93.01...93.03
25	1...3	100 ms		93.04...93.06
***** Time within the drive reads data from the datasets to the parameter table or writes data from the parameter table to the datasets. Since the drive is a follower of the communication master, the actual communication cycle time depends on the communication speed of the master.				
** Boolean data type parameters are not supported. If boolean data type parameters need to be set to the external control system, use datasets 15...25.				

Block diagram: reference select

The figure below shows the parameters for DC and reactive power reference selection.



Data words

The Control Word (CW) is the principal means of controlling the drive from a fieldbus system. The Control Word is sent by the external control system to the drive. The drive switches between its states according to the bit-coded instructions of the Control Word.

The Status Word (SW) is a word containing status information, sent by the drive to the external control system.

07.01 MAIN CNTRL WORD

Actual signal 07.01 MAIN CNTRL WORD is the main control word of the converter. On the control panel the value is shown in hexadecimal format. See also section *Starting sequence* on page *15*. (Update interval is 10 ms.)

Bit	Name	Value	Description
0	ON/OFF	0 ⇒1	Start charging (close charging contactor).
		0	Open main contactor (switch power off).
1, 2	Not in use		
3	START	1	Start modulation.
		0	Stop modulation.
4...6	Not in use		
7	RESET	0 ⇒1	Reset.
		0	–
8...15		0	Not in use

08.01 MAIN STATUS WORD

Actual signal 08.01 MAIN STATUS WORD is the main status word of the converter. On the control panel the value is shown in hexadecimal format. See also section *Starting sequence* on page *15*. (Update interval is 4 ms.)

Bit	Name	Value	STATE/Description
0	RDY_ON	1	Ready to switch on = no fault
		0	Not ready to switch on = fault
1	RDY_RUN	1	Ready to operate = DC bus charged
		0	Not ready to operate
2	RDY_REF	1	Operation enabled
		0	
3	TRIPPED	1	Fault
		0	No fault
4, 5, 6		–	Not in use
7	ALARM	1	Warning
		0	No Warning
8	MODULATING	1	Converter modulates.
		0	Converter is not modulating.
9	REMOTE	1	Drive control location: REMOTE
		0	Drive control location: LOCAL
10	NET OK	1	Network voltage is OK.
		0	Network voltage is lost.
11		–	Not in use
12		–	Not in use
13	CHARGING OR RDY_RUN		Combines bits 14 and 1.
		1	Ready to operate = DC bus charged or Charging contactor closed
		0	Not ready to operate or Charging contactor open
14	CHARGING	1	Charging contactor closed
		0	Charging contactor open
15		–	Not in use

Fault and alarm words

09.01 FAULT WORD 1

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 100 ms.)

Bit	Name	Description
0	SHORT CIRC	Short circuit in the main circuit
1	OVERCURRENT	Overcurrent
2	DC OVERVOLT	Intermediate circuit DC overvoltage
3	ACS800 TEMP	IGBT overtemperature
4	EARTH FAULT	Internally detected earth (ground) fault
5, 6	Not in use	
7	Internals faults	Internal fault. If the bit is 1, write down the fault message from the fault logger and contact your local ABB representative.
8...15	Not in use	
Bit value: 1 = fault, 0 = no fault		

09.02 FAULT WORD 2

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 100 ms.)

Bit	Name	Description
0	SUPPLY PHASE	Missing phase during synchronisation
1	Not in use	
2	DC UNDERVOLT	Intermediate circuit DC undervoltage
3...5	Not in use	
6	IO FAULT	I/O device fault on DDCS channel CH1
7	CTRL B TEMP	RMIO control board overtemperature
8	Not in use	
9	OVER SWFREQ	Switching overfrequency
10	Not in use	
11	PPCC LINK	PPCC link fault
12	COMM MODULE	Communication error between drive and type Rxxx fieldbus module or between drive and external control system
13...15	Not in use	
Bit value: 1 = fault, 0 = no fault		

09.11 SUPPLY FAULT WORD

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 100 ms.)

Bit	Name	Description
0	CHARGING FLT	DC link short-circuit during charging
1	OVERCURRENT	Overcurrent
2	EXT EVENT DI5	External fault indicated via digital input DI5
3	ACS 800 TEMP	IGBT overtemperature
4	E EARTH FLT	Earth (ground) fault detected by an external monitoring device
5	DI1	Fan failure. Fault is activated 5 seconds after failure.
6	MAIN CNT FLT	Main contactor failure
7	SHORT CIRC	Short-circuit in the main circuit
8	Internal fault	Internal fault. If this bit is 1, write down the fault message from the fault logger and contact your local ABB representative.
9	NET VOLT FLT	Supply voltage out of range during synchronisation
10	COMM MODULE	Communication error between drive and type Rxxx fieldbus module or between drive and external control system
11	Not in use	
12	EARTH FAULT	Internally detected earth (ground) fault
13	SYNCHRO FLT	Synchronisation to supply failed
14	DC UNDERVOLT	Intermediate circuit DC undervoltage
15	DC OVERVOLT	Intermediate circuit DC overvoltage
Bit value: 1 = fault, 0 = no fault		

09.12 SUPPLY ALARM WORD

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 100 ms.)

Bit	Name	Description
0	COMM MODULE	Communication break detected
1	PANEL LOST	Local control lost.
2	DI1	DI1 alarm. Alarm is activated 0.5 seconds after failure.
3	AI<MIN FUNC	Current below 4 mA (4 mA minimum selected)
4	ACS 800 TEMP	IGBT overtemperature
5	CURRENT LIM	Current limit exceeded
6...9	Not in use	
10	NET LOST	Network voltage lost
11, 12	Not in use	
13	EARTH FAULT	Internally detected earth (ground) fault
	E EARTH FLT	Earth fault detected by an external monitoring device
14	EXT EVENT DI5	External fault indicated via digital input DI5
15	Not in use	
Bit value: 1 = fault, 0 = no fault		

09.13 CURRENT UNBALANCE

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 2 ms.)

Bit	Name	Description
0	CUR UNBAL 1	Excessive output current unbalance in converter unit 1 of parallel connected converter modules
1	CUR UNBAL 2	Excessive output current unbalance in converter unit 2 of parallel connected converter modules
2	CUR UNBAL 3	Excessive output current unbalance in converter unit 3 of parallel connected converter modules
3	CUR UNBAL 4	Excessive output current unbalance in converter unit 4 of parallel connected converter modules
4	CUR UNBAL 5	Excessive output current unbalance in converter unit 5 of parallel connected converter modules
5	CUR UNBAL 6	Excessive output current unbalance in converter unit 6 of parallel connected converter modules
6	CUR UNBAL 7	Excessive output current unbalance in converter unit 7 of parallel connected converter modules
7	CUR UNBAL 8	Excessive output current unbalance in converter unit 8 of parallel connected converter modules
8	CUR UNBAL 9	Excessive output current unbalance in converter unit 9 of parallel connected converter modules
9	CUR UNBAL 10	Excessive output current unbalance in converter unit 10 of parallel connected converter modules
10	CUR UNBAL 11	Excessive output current unbalance in converter unit 11 of parallel connected converter modules
11	CUR UNBAL 12	Excessive output current unbalance in converter unit 12 of parallel connected converter modules
12...15	Not in use	
Bit value: 1 = fault, 0 = no fault		

09.14 OVERCURRENT FAULT

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 2 ms.)

Bit	Name	Description
0	OVERCURR 1	Excessive input current in converter unit 1 of parallel connected converter modules
1	OVERCURR 2	Excessive input current in converter unit 2 of parallel connected converter modules
2	OVERCURR 3	Excessive input current in converter unit 3 of parallel connected converter modules
3	OVERCURR 4	Excessive input current in converter unit 4 of parallel connected converter modules
4	OVERCURR 5	Excessive input current in converter unit 5 of parallel connected converter modules
5	OVERCURR 6	Excessive input current in converter unit 6 of parallel connected converter modules
6	OVERCURR 7	Excessive input current in converter unit 7 of parallel connected converter modules
7	OVERCURR 8	Excessive input current in converter unit 8 of parallel connected converter modules
8	OVERCURR 9	Excessive input current in converter unit 9 of parallel connected converter modules
9	OVERCURR 10	Excessive input current in converter unit 10 of parallel connected converter modules
10	OVERCURR 11	Excessive input current in converter unit 11 of parallel connected converter modules
11	OVERCURR 12	Excessive input current in converter unit 12 of parallel connected converter modules
12...15	Not in use	
Bit value: 1 = fault, 0 = no fault		

09.15 SHORT CIRC FAULT

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 2 ms.)

Bit	Name	Description
0	SC INV U 1	Short circuit in converter unit 1 of parallel connected converter modules
1	SC INV U 2	Short circuit in converter unit 2 of parallel connected converter modules
2	SC INV U 3	Short circuit in converter unit 3 of parallel connected converter modules
3	SC INV U 4	Short circuit in converter unit 4 of parallel connected converter modules
4	SC INV U 5	Short circuit in converter unit 5 of parallel connected converter modules
5	SC INV U 6	Short circuit in converter unit 6 of parallel connected converter modules
6	SC INV U 7	Short circuit in converter unit 7 of parallel connected converter modules
7	SC INV U 8	Short circuit in converter unit 8 of parallel connected converter modules
8	SC INV U 9	Short circuit in converter unit 9 of parallel connected converter modules
9	SC INV U 10	Short circuit in converter unit 10 of parallel connected converter modules
10	SC INV U 11	Short circuit in converter unit 11 of parallel connected converter modules
11	SC INV U 12	Short circuit in converter unit 12 of parallel connected converter modules
12	SC PHASE U	Short circuit in phase U of converter module
13	SC PHASE V	Short circuit in phase V of converter module
14	SC PHASE W	Short circuit in phase W of converter module
Bit value: 1 = fault, 0 = no fault		

09.16 OVERTEMP WORD

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 2 ms.)

Bit	Name	Description
0	ACS TEMP INV1	Overtemperature in converter unit 1 of parallel connected converter modules
1	ACS TEMP INV2	Overtemperature in converter unit 2 of parallel connected converter modules
2	ACS TEMP INV3	Overtemperature in converter unit 3 of parallel connected converter modules
3	ACS TEMP INV4	Overtemperature in converter unit 4 of parallel connected converter modules
4	ACS TEMP INV5	Overtemperature in converter unit 5 of parallel connected converter modules
5	ACS TEMP INV6	Overtemperature in converter unit 6 of parallel connected converter modules
6	ACS TEMP INV7	Overtemperature in converter unit 7 of parallel connected converter modules
7	ACS TEMP INV8	Overtemperature in converter unit 8 of parallel connected converter modules
8	ACS TEMP INV9	Overtemperature in converter unit 9 of parallel connected converter modules
9	ACS TEMP INV10	Overtemperature in converter unit 10 of parallel connected converter modules
10	ACS TEMP INV11	Overtemperature in converter unit 11 of parallel connected converter modules
11	ACS TEMP INV12	Overtemperature in converter unit 12 of parallel connected converter modules
12	OVERTEMP PHASE U	Overtemperature in phase U
13	OVERTEMP PHASE V	Overtemperature in phase V
14	OVERTEMP PHASE W	Overtemperature in phase W
Bit value: 1 = fault, 0 = no fault		

09.17 TEMP DIF FLT WORD

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 2 ms.)

Bit	Name	Description
0	TEMPD INV1	Temperature difference fault in converter unit 1 of parallel connected converter modules
1	TEMPD INV2	Temperature difference fault in converter unit 2 of parallel connected converter modules
2	TEMPD INV3	Temperature difference fault in converter unit 3 of parallel connected converter modules
3	TEMPD INV4	Temperature difference fault in converter unit 4 of parallel connected converter modules
4	TEMPD INV5	Temperature difference fault in converter unit 5 of parallel connected converter modules
5	TEMPD INV6	Temperature difference fault in converter unit 6 of parallel connected converter modules
6	TEMPD INV7	Temperature difference fault in converter unit 7 of parallel connected converter modules
7	TEMPD INV8	Temperature difference fault in converter unit 8 of parallel connected converter modules
8	TEMPD INV9	Temperature difference fault in converter unit 9 of parallel connected converter modules
9	TEMPD INV10	Temperature difference fault in converter unit 10 of parallel connected converter modules
10	TEMPD INV11	Temperature difference fault in converter unit 11 of parallel connected converter modules
11	TEMPD INV12	Temperature difference fault in converter unit 12 of parallel connected converter modules
12	TEMPD PHASE U	Temperature difference fault in phase U
13	TEMPD PHASE V	Temperature difference fault in phase V
14	TEMPD PHASE W	Temperature difference fault in phase W
Bit value: 1 = fault, 0 = no fault		

09.18 TEMP DIF ALM WORD

For the possible causes and remedies, see chapter *Fault tracing*. (Update interval is 2 ms.)

Bit	Name	Description
0	TEMPD INV1	Temperature difference alarm in converter unit 1 of parallel connected converter modules
1	TEMPD INV2	Temperature difference alarm in converter unit 2 of parallel connected converter modules
2	TEMPD INV3	Temperature difference alarm in converter unit 3 of parallel connected converter modules
3	TEMPD INV4	Temperature difference alarm in converter unit 4 of parallel connected converter modules
4	TEMPD INV5	Temperature difference alarm in converter unit 5 of parallel connected converter modules
5	TEMPD INV6	Temperature difference alarm in converter unit 6 of parallel connected converter modules
6	TEMPD INV7	Temperature difference alarm in converter unit 7 of parallel connected converter modules
7	TEMPD INV8	Temperature difference alarm in converter unit 8 of parallel connected converter modules
8	TEMPD INV9	Temperature difference alarm in converter unit 9 of parallel connected converter modules
9	TEMPD INV10	Temperature difference alarm in converter unit 10 of parallel connected converter modules
10	TEMPD INV11	Temperature difference alarm in converter unit 11 of parallel connected converter modules
11	TEMPD INV12	Temperature difference alarm in converter unit 12 of parallel connected converter modules
12	TEMPD PHASE U	Temperature difference alarm in phase U
13	TEMPD PHASE V	Temperature difference alarm in phase V
14	TEMPD PHASE W	Temperature difference alarm in phase W
Bit value: 1 = fault, 0 = no fault		

Fault tracing

What this chapter contains

This chapter lists all alarm and fault messages including the possible causes and corrective actions.

Safety

WARNING! Only qualified electricians are allowed to maintain the drive. The safety instructions on the first pages of the appropriate hardware manual or safety manual must be read before you start working with the drive.

Alarm and fault indications

An alarm or a fault message on the panel display indicates abnormal drive status. Most alarm and fault causes can be identified and corrected using this information. If not, an ABB representative should be contacted.

It is assumed that there is a control panel connected to the line-side converter. For instructions on how to use the control panel, see the firmware manual of the motor-side converter application program. If the converter is operated with the control panel detached, the red LED in the panel mounting platform indicates the fault condition. (**Note:** Some converter types are not fitted with the LEDs as standard).

The four digit code number in brackets after the message is for the fieldbus communication. See chapter *Fieldbus control*.

How to reset

The converter can be reset either by pressing the keypad ***RESET*** key, by digital input or fieldbus or switching the supply voltage off for a while. When the fault has been removed, the drive can be restarted.

Fault history

When a fault is detected, it is stored in the fault history. The latest faults and alarms are stored together with the time stamp at which the event was detected.

The fault logger collects 64 of the latest faults. When the drive power is switched off, 16 of the latest faults are stored.

The Fault History can be viewed by pressing the control panel double arrow keys (⏫ or ⏬) in the Actual Signal Display Mode. The fault history can then be scrolled with arrow keys (🔼 and 🔽). To exit the fault history press an arrow key (⏫ or ⏬). The fault history can be cleared by pressing the ***RESET*** key.

Warning messages

Warning	Cause	What to do
ACS 800 TEMP (4210) (09.12 SUPPLY ALARM WORD bit 4)	Converter IGBT temperature is excessive. Warning is activated if temperature exceeds 135°C.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check line current against converter current.
AI<MIN FUNC (8110) (09.12 SUPPLY ALARM WORD bit 3)	Analogue control signal 4...20 mA is below minimum allowed value 3.1 mA. This can be caused by incorrect signal level or failure in control wiring.	Check for proper analogue control signal level. Check minimum limit settings (parameters 13.06 MINIMUM AI2 and 13.10 MINIMUM AI3). Check control wiring.
ALM (xx) (08.01 MAIN STATUS WORD bit 7)	Converter internal alarm	Check connections in converter cabinet. Write down alarm code (in brackets). Contact your local ABB representative.
BATT FAILURE (5581)	APBU branching unit memory backup battery error caused by - incorrect APBU switch S3 setting - too low battery voltage	With parallel connected converters, enable backup battery by setting actuator 6 of switch S3 to ON. Replace backup battery. **Note:** Actuator 6 of switch S3 is normally activated (ON) during commissioning. **Note:** Set actuator 6 of switch S3 to OFF when APBU is stored as spare part.
COMM MODULE (7510) (09.12 SUPPLY ALARM WORD bit 0) (Programmable fault or alarm: See parameters 70.04 and 70.05.)	Cyclical communication between drive and type Rxxx fieldbus module or between drive and external control system connected to DDCS channel CH0 is lost.	Check fieldbus communication status. See chapter *Fieldbus control*, or appropriate fieldbus adapter manual. Check group 51 MASTER ADAPTER (fieldbus adapter) parameter settings. Check group 52 STANDARD MODBUS (Standard Modbus link) parameter settings. Check that channel CH0 node address is correct (parameter 70.01 CH0 NODE ADDR). Check that bus master is communicating and correctly configured. Check cable connections and earthings. Check optic fibres between Advant Controller (or type Nxxx fieldbus adapter) and RMIO board DDCS channel CH0. Replace fibre optic cables.
CURRENT LIM (09.12 SUPPLY ALARM WORD bit 5)	Current limit is exceeded.	Limit inverter actual power or decrease reactive power generation reference value (parameter 24.01 Q POWER REF).
DI1 (09.12 SUPPLY ALARM WORD bit 2)	Fan is not rotating or fan contactor connection is loose. This supervision is valid only when converter is in RDY_RUN state (i.e. 08.01 Main Status Word bit 1 = 1).	Check acknowledge circuit connected to digital input DI1. Check fan. Replace fan.
EXT EVENT DI5 (09.12 SUPPLY ALARM WORD bit 14) (Programmable fault or alarm: See parameter 30.05.)	Digital input DI5 alarm	Check digital input DI5. Check parameter 30.05 EXT EVENT setting.

Warning	Cause	What to do
E EARTH FLT (09.12 SUPPLY ALARM WORD bit 13) (Programmable fault or alarm: See parameter 30.04.)	Earth fault in IT (Ungrounded) Network Impedance between live part (e.g. phase conductor, DC link, motor cable or motor) and earth (ground) is too low. Earth (ground) fault in LCL filter, converter, DC link, inverter(s), motor cables or motor	Check converter and LCL filter for earth leakages. Check motor(s) and motor cables. Check inverter(s). Check parameter 30.04 EXT EARTH FAULT settings.
EARTH FAULT (2330) (09.12 SUPPLY ALARM WORD bit 13) (Programmable fault or alarm: See parameter 30.02.)	Earth fault in Earthed/Grounded Network Sum of line currents measured with internal current transducers is too high. Earth (ground) fault in LCL filter, converter, DC link, inverter(s), motor cables or motor, or current imbalance in parallel connected converter modules Earth (ground) fault level can be too sensitive.	Check converters fuses (parallel connected converter modules). Check converter and LCL filter for earth leakages. Check motors. Check motor cables. Check inverter(s). Check parameter 30.03 EARTH FAULT LEVEL settings.
NET LOST (09.12 SUPPLY ALARM WORD bit 10)	Network voltage is lost during modulation. Line current is below supervision limit or line frequency differs more than 5 Hz from initialised value of 50 or 60 Hz. For more information, see section *Missing phase* on page *21*.	Check network conditions (power breaks, voltage transients). Check input power connections. Check input fuses.
PANEL LOST (5300) (09.12 SUPPLY ALARM WORD bit 1)	Local control device (control panel or DriveWindow PC tool) selected as active control location has ceased communicating. **Note:** Converter shifts to remote control mode automatically.	Check control panel or PC tool connection. Check control panel connector. See hardware manual. Replace control panel.
NO COMMUNICATION (x)	This alarm message is generated by control panel. - Cabling problem or hardware malfunction detected on panel link. - If (x) = (4), panel type is not compatible with converter program version.	Check panel link connections. Press ***RESET*** key. Reset may take up to half a minute, please wait. Check panel type and version of converter application program (see parameter group 04 INFORMATION). Panel type is printed on panel cover.
ID N CHANGED	Converter ID number has been changed from 1 (change is not displayed on control panel).	To change ID number back to 1 go to Drive Selection Mode by pressing ***DRIVE***. Press ***ENTER***. Set ID number to 1. Press ***ENTER***.
LOAD FACTORY	Factory parameter settings are being restored.	Wait until restore is completed.
REPLACE FAN	Running time of converter cooling fan has exceeded its estimated life time.	Change fan. Reset fan run time counter. See parameter 01.31 FAN ON-TIME.
TEMP DIF x y (4380) (09.18 TEMP DIF ALM WORD)	Excessive temperature difference between several parallel connected converter modules. x (1...12 R8i) refers to converter module number and y (U, V, W) refers to phase. Excessive temperature can be caused e.g. by unequal current sharing between parallel connected converters.	Check cooling fan. Replace fan. Check air filters.

Fault messages

Fault Text	Cause	What to do
ACS 800 TEMP (4210) (09.01 FAULT WORD 1 bit 3) (09.11 SUPPLY FAULT WORD bit 3)	Converter IGBT temperature is excessive. Trip level is 140°C.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check line current against converter current.
ACS TEMP x y (4210) (09.16 OVERTEMP WORD)	Excessive internal temperature in converter unit of several parallel connected converter modules. x (1...12 R8i) refers to faulty converter module number and y (U, V, W) refers to phase.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against converter power.
CTRL B TEMP (4110) (09.02 FAULT WORD 2 bit 7)	RMIO control board temperature exceeds 88°C.	Check air flow and fan operation.
CHARGING FLT (09.11 SUPPLY FAULT WORD bit 0)	DC link voltage is not high enough after charging. DC link voltage has not exceeded minimum limit or current is not below preset limit. Faulty PPCC link (DC voltage measurement is zero)	Check charging circuit fuses. Check charging circuit. Check possible short circuit in DC link. Check undervoltage trip limit (parameter 30.12 DC UNDERVOLT TRIP). Check PPCC link. See fault message PPCC LINK.
COMM MODULE (7510) (09.02 FAULT WORD 2 bit 12) (09.11 SUPPLY FAULT WORD bit 10) (Programmable fault or alarm: See parameters 70.04 and 70.05.)	Cyclical communication between drive and type Rxxx fieldbus module or between drive and external control system connected to DDCS channel CH0 is lost.	Check fieldbus communication status. See chapter *Fieldbus control*, or appropriate fieldbus adapter manual. Check group 51 MASTER ADAPTER (fieldbus adapter) parameter settings. Check group 52 STANDARD MODBUS (Standard Modbus link) parameter settings. Check that channel CH0 node address is correct (parameter 70.01 CH0 NODE ADDR). Check that bus master is communicating and correctly configured. Check cable connections and earthings. Check optic fibres between Advant Controller (or type Nxxx fieldbus adapter) and RMIO board DDCS channel CH0. Replace fibre optic cables.
CUR UNBAL xx (2330) (09.13 CURRENT UNBALANCE)	Excessive output current unbalance in converter unit of several parallel connected converter modules. xx (2...12) refers to faulty converter module number.	Check motor. Check motor cable. Check converter fuses. Check converter. Check inverter(s). Check LCL filter.
DC OVERVOLT (3210) (09.01 FAULT WORD 1 bit 2) (09.11 SUPPLY FAULT WORD bit 15)	Excessive intermediate circuit DC voltage. This can be caused by - static or transient overvoltages in mains, or - excessive supply voltage during synchronisation. Default trip limit is 427 VDC for 240 V units, 740 VDC for 415 V units, 891 VDC for 500 V units and 1230 VDC for 690 V units.	Check level of supply voltage, DC voltage and converter nominal voltage. Check DC overvoltage trip limit (parameter 30.11).

Fault Text	Cause	What to do
DC UNDERVOLT (3220) (09.02 FAULT WORD 2 bit 2) (09.11 SUPPLY FAULT WORD bit 14)	Intermediate circuit DC voltage is not sufficient due to missing mains phase, blown fuse or converter internal fault. Default trip limit is 170 VDC for 240 V units, 293 VDC for 415 V units, 354 VDC for 500 V units and 488 VDC for 690 V units.	Check supply and converter fuses. Check supply voltage. Check DC undervoltage trip limit (parameter 30.12).
DI1 (09.11 SUPPLY FAULT WORD bit 5)	Fan is not rotating or fan contactor connection is loose. This supervision is valid only when converter is in RDY_RUN state (i.e. 08.01 Main Status Word bit 1 = 1).	Check acknowledge circuit connection to digital input DI1. Check fan. Replace fan.
EXT EVENT DI5 (09.11 SUPPLY FAULT WORD bit 2) (Programmable fault or alarm: See parameters 30.05 and 30.10.)	Digital input DI5 fault	Check digital input DI5. Check parameter 30.05 EXT EVENT and 30.10 DI5 TRIP DELAY settings.
E EARTH FLT (09.11 SUPPLY FAULT WORD bit 4) (Programmable fault or alarm: See parameter 30.04.)	Earth fault in IT (Ungrounded) Network Impedance between live part (e.g. phase conductor, DC link, motor cable or motor) and earth (ground) is too low. Earth (ground) fault in LCL filter, converter, DC link, inverter(s), motor cables or motor	Check converter and LCL filter for earth leakages. Check motor(s) and motor cables. Check inverter(s). Check parameter 30.04 EXT EARTH FAULT settings.
EARTH FAULT (2330) (09.01 FAULT WORD 1 bit 4) (09.11 SUPPLY FAULT WORD bit 12) (Programmable fault or alarm: See parameter 30.02.)	Earth fault in Earthed/grounded Network Sum of line currents measured with internal current transducers is too high. Earth (ground) fault in LCL filter, converter, DC link, inverter(s), motor cables or motor, or current imbalance in parallel connected converters Earth (ground) fault level can be too sensitive.	Check converter fuses (parallel connected converter modules). Check converter and LCL filter for earth leakages. Check motors. Check motor cables. Check inverter(s). Check parameter 30.03 EARTH FAULT LEVEL settings.
FLT (xx) (08.01 MAIN STATUS WORD bit 3)	Converter internal fault	Check connections inside converter cabinet. Write down Fault code (in brackets). Contact your local ABB representative.
INT CONFIG (5410)	Number of parallel connected converter modules defined by parameter 16.10 INT CONFIG USER is incorrect.	Check parameter 16.10 INT CONFIG USER setting.
IO FAULT (09.02 FAULT WORD 2 bit 6)	I/O communication fault or error detected on channel CH1 of RDCO module. This can be caused by fault in RDCO module or control board (RMIO) or faulty/loose fibre optic cable connection.	Check connections between RMIO and RDCO module. Test with new fibre optic cables. Replace RDCO module / RMIO board.
MAIN CNT FLT (09.11 SUPPLY FAULT WORD bit 6)	Main contactor is not functioning properly, or connection is loose.	Check main contactor control circuit wiring. Check main contactor operating voltage level (should be 230 V). Check digital input DI3 connections.
NET VOLT FLT (09.11 SUPPLY FAULT WORD bit 9)	Main supply voltage is out of acceptable range during synchronisation or Line-side Identification. Trip limits is 115 V for 230 V units, 208 V for 415 V units, 250 V for 500 V units and 345 V for 690 V units.	Check main supply voltage. Restart unit.

Fault Text	Cause	What to do
OVERCURR xx (2310) 09.01 FAULT WORD 1 bit 1 09.11 SUPPLY FAULT WORD bit 1 09.14 OVERCURRENT FAULT	Overcurrent fault in converter unit of several parallel connected converter modules. xx (2...12) refers to faulty converter module number.	Check motor load. Check supply voltage. Check that there are no power factor compensation capacitors in supply. Check converter power semiconductors (IGBTs) and current transducers.
OVERCURRENT (2310) (09.01 FAULT WORD 1 bit 1 09.11 SUPPLY FAULT WORD bit 1)	Excessive input current. There are two overcurrent trip limits: - 0.98 ·converter maximum current (parameter 04.08) - approximately 190% of converter nominal current (parameter 04.05).	Check motor load. Check supply voltage. Check that there are no power factor compensation capacitors in supply. Check converter power semiconductors (IGBTs) and current transducers.
OVER SWFREQ (FF55) (09.02 FAULT WORD 2 bit 9)	Switching overfrequency fault. This may be due to hardware fault in electronic boards.	Replace RMIO board. Replace INT board. With parallel connected converter modules replace APBU (or NPBU) branching unit.
POWERF INV xx (3381)	INT board powerfail in converter unit of several parallel connected converter modules. xx refers to faulty converter module number.	Check that INT board power cable is connected. Check that POW board is working correctly. Replace INT board.
PPCC LINK xx (5210) (09.02 FAULT WORD 2 bit 11)	INT board current measurement or communication fault between RMIO and INT boards Fault indication is activated when charging is completed and DC link voltage is high but not when DC link voltage is disconnected and RMIO board has external power supply. xx (1...12) refers to faulty converter module number. Fault can be caused by faulty power plate. Branching unit type defined by parameter 112.16 PBU BOARD TYPE is incorrect.	Check fibre optic cable connection between RMIO and INT boards. With parallel connected converter modules, also check cabling to APBU (or NPBU) branching unit. If fault is still active, replace APBU (or NPBU) branching unit (only with parallel connected converter modules), RMIO and INT board (in this order) until fault disappears. Replace fibre optic cables. If RMIO is powered from external supply, ensure that supply is on. Check converter power semiconductors (IGBTs). Check that there is no short circuit in power stage. Short circuit or overcurrent caused by faulty IGBTs can activate PPCC LINK fault. With parallel connected converters, check parameter 112.16 PBU BOARD TYPE setting. **Note:** Parameters above 100 are not visible unless password is entered for parameter lock in parameter 16.03 PASS CODE. These parameters are not allowed to be changed without ABB's permission.
SHORT CIRC (2340) (09.01 FAULT WORD 1 bit 0)	Short circuit fault	Measure resistances of converter power semiconductors (IGBTs). If faulty IGBTs are found, replace IGBTs and/or INT and/or NGDR boards or converter module. Check main circuit.

Fault Text	Cause	What to do
SC INV xx y (2340) 09.01 FAULT WORD 1 bit 0 09.11 SUPPLY FAULT WORD bit 7 09.15 SHORT CIRC FAULT	Short circuit in phase module of several parallel connected converter modules. xx (1...12) refers to faulty converter module number and y (U, V, W) refers to faulty phase.	Measure resistances of converter power semiconductors (IGBTs). If faulty IGBTs are found, replace IGBTs and/or INT and/or NGDR boards or converter module. Check main circuit.
SUPPLY PHASE (3130) (09.02 FAULT WORD 2 bit 0)	Missing phase during synchronisation	Check supply fuses. Check supply for network imbalance.
SYNCHRO FLT (09.11 SUPPLY FAULT WORD bit 13)	Synchronisation to supply network has failed. Supply frequency has changed remarkably since Line-side Identification routine.	Perform Line-side Identification routine again. See parameter 99.07 LINE SIDE ID RUN.
TEMP DIF x y (4380) (09.17 TEMP DIF FLT WORD)	Excessive temperature difference between several parallel converter modules. x (1...12 R8i) refers to converter module number and y (U, V, W) refers to phase. Excessive temperature can be caused e.g. by unequal current sharing between parallel connected converter modules.	Check cooling fan. Replace fan. Check air filters.
USER MACRO (FFA1)	No User Macro saved or file is defective.	Create User Macro again.

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